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ORIGINAL PAPER

THE ROLE OF GREEN MARKETING AND GREENWASHING IN SHAPING THE ORGANIC FOOD MARKET IN POLAND

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JEL Classification: Q18, C83.

K e y w o r d s: green marketing, greenwashing, organic food, consumer awareness, brand trust.

A b s t r a c t

The aim of this article was to analyse the role of green marketing and the phenomenon of greenwashing in shaping the organic food market in Poland. To achieve this objective, a literature review was conducted alongside a diagnostic survey using the CAWI method, covering a sample of 168 consumers. The study focused on evaluating consumer awareness, trust in marketing activities, and perceptions of greenwashing. The research results indicate that consumer awareness of the concept of greenwashing is low, with only 24.4% of respondents able to correctly define the term. Respondents declared moderate trust in the marketing efforts of organic food companies, with eco-certificates and product labels being identified as the main factors fostering brand credibility. Additionally, 35.4% of participants reported encountering greenwashing practices, highlighting the need for transparent and authentic marketing communication. High product prices were identified as the primary barrier limiting the purchase of organic food. The study findings emphasize the necessity of authentic green marketing supported by credible certification, transparent messaging, and educational initiatives to increase consumer awareness and trust, ultimately supporting the sustainable development of the organic food market in Poland.

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ZIELONY MARKETING I ZJAWISKO GREENWASHINGU W KSZTAŁTOWANIU RYNKU ŻYWNOŚCI EKOLOGICZNEJ W POLSCE

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Kody JEL: Q18, C83.

Słowa kluczowe: zielony marketing, greenwashing, żywność ekologiczna, świadomość konsumentów, zaufanie do marki.

Abstrakt

Celem badań była identyfikacja znaczenia zielonego marketingu oraz zjawiska greenwashingu w kształtowaniu rynku żywności ekologicznej w Polsce. W badaniach wykorzystano przegląd literatury oraz sondaż diagnostyczny przeprowadzony metodą CAWI na próbie 168 konsumentów. Analiza koncentrowała się na ocenie świadomości konsumentów, poziomu zaufania do działań marketingowych oraz percepcji greenwashingu. Wyniki badań wskazały na niski poziom świadomości tego zjawiska – jedynie 24,4% respondentów potrafiło poprawnie zdefiniować pojęcie greenwashingu. Badani deklarowali umiarkowane zaufanie do działań marketingowych firm oferujących żywność ekologiczną, przy czym za najważniejsze czynniki budujące wiarygodność uznali certyfikaty ekologiczne oraz oznaczenia na opakowaniach. Dodatkowo 35,4% respondentów zadeklarowało, że spotkało się z przypadkami greenwashingu, co podkreśla potrzebę większej transparentności i autentyczności w komunikacji marketingowej. Najczęściej wskazywaną barierą zakupu żywności ekologicznej była jej wysoka cena. Wyniki badań podkreślają znaczenie prowadzenia rzetelnego zielonego marketingu, wspartego wiarygodną certyfikacją, przejrzystą komunikacją oraz działaniami edukacyjnymi, które mogą zwiększyć zaufanie konsumentów i wspierać zrównoważony rozwój rynku żywności ekologicznej w Polsce.

Introduction

The contemporary organic food market is developing dynamically in response to growing consumer interest in healthy lifestyles, environmental protection, and sustainable consumption (Kuberska *et al.*, 2020). Despite this growth, the segment remains niche in Poland, particularly in terms of domestic demand, which is limited by low public awareness and the relatively high prices of organic products (Grzybowska-Brzezińska, 2020, p. 114). Marketing activities play a key role in shaping consumer preferences, aiming not only to inform about organic products but also to build brand trust and support a positive ecological image (Nestorowicz, 2010, p. 395).

One of the important trends in contemporary marketing is green marketing, which includes strategies promoting environmentally friendly products through, among other things, the use of ecological packaging, certification, and advertising messages emphasizing environmental care (Ihnatenko, 2022, p. 25, 26).

Green marketing not only addresses the needs of environmentally conscious consumers but also aligns with the broader paradigm of sustainable development (Bojanowska, 2022, p. 17).

Alongside genuine pro-environmental efforts, the phenomenon of greenwashing has emerged – defined as misleading consumers about the actual environmental benefits of a product, service, or company activity (Mazur-Wierzbicka, 2022, p. 284). Greenwashing poses a significant threat to the credibility of marketing communication, as it can lead to declining consumer trust and growing skepticism towards environmental claims (Vangeli *et al.*, 2023, p. 281). In the Polish organic food market, certifications and information provided on packaging are of key importance, as they strengthen consumer trust and support the development of this sector. At the same time, consumers are increasingly recognizing dishonest marketing practices (Kuczuk, 2022, p. 9).

This raises the question: what is the actual significance of green marketing and the phenomenon of greenwashing in shaping the food market, as indicated by the study participants?

Literature Review

Green marketing, also known as eco-marketing or environmental marketing, has for several decades constituted a significant area of research and analysis in both domestic and international literature. Its growing importance stems from global environmental challenges as well as increasing consumer awareness regarding the environmental impact of products and services (Ihnatenko, 2022, p. 25, 26).

Pro-environmental marketing strategy is defined as a set of actions aimed at promoting goods and services with a reduced environmental impact (Nestorowicz, 2010, p. 395). Commonly used practices within green marketing include reducing greenhouse gas (GHG) emissions in production processes, using packaging made from recycled materials, and running campaigns that promote environmental responsibility (Ćalasan *et al.*, 2021, p. 73). Moreover, the core tools of green marketing encompass the classical elements of the marketing mix – product, price, promotion, and distribution (Mahmoud, 2018, p. 128, 129). It is essential not only to adapt the product to meet environmental requirements but also to communicate this value to customers effectively and credibly (Bojanowska, 2022, p. 17).

To effectively support the development of the organic food market, green marketing activities should be coherent and focused on building consumer awareness and trust. This requires not only implementing pro-environmental practices at the company level but also ensuring transparent marketing communication, supported by recognized certifications and eco-labels

(Nestorowicz, 2010, p. 395). Only through such an approach can consumer trust be fostered and the risk of greenwashing mitigated (de Freitas Netto *et al.*, 2020, p. 8, 9).

Greenwashing is a marketing strategy wherein companies exaggerate or falsify the environmental attributes of their products or services to attract and retain environmentally conscious consumers. These actions, although intended to gain market advantage, are often not backed by actual environmental practices (Somany, 2023, p. 908). Greenwashing undermines brand trust and can diminish the effectiveness of marketing based on genuine environmental concern (Mazur-Wierzbicka, 2022, p. 284). A company's excessive focus on creating a "green" image without substantive actions may lead to resource waste, reduced production efficiency, and decreased trust among customers and regulatory bodies (Alvarado *et al.*, 2024, p. 109).

Consumers increasingly expect not only pro-environmental declarations but also their validation through recognized certifications and eco-labels (Nestorowicz, 2010, p. 395). Transparency of actions has become critical for building customer loyalty and long-term brand reputation (Qayyum *et al.*, 2023, p. 289). At the same time, the rising number of greenwashing cases can erode consumer trust not only in individual companies but in the entire category of organic products, thereby hindering the development of the organic food market (Somany, 2023, p. 909). Local food is increasingly seen as part of sustainable consumption practices, although the lack of a clear definition complicates its unambiguous classification in the context of sustainable development (Cappelli *et al.*, 2022, p. 8). Consumers attach great importance to product quality and origin labels, yet trust in certifications and the interpretation of "locality" vary among consumer groups, which may foster misunderstandings and communication abuses associated with greenwashing (Hristov *et al.*, 2023, p. 10). Additionally, the development of a company's green reputation may mediate between green marketing efforts and their actual environmental outcomes, strengthening consumer confidence in declared eco-friendly actions (Wang & Juo, 2024, p. 1758). Furthermore, research shows that individual elements of green marketing, such as price and point of sale, significantly influence repurchase intentions, with consumer ecological knowledge further enhancing these relationships (Mahmoud *et al.*, 2024, p. 503). Ecological certification plays a crucial role in building consumer trust, though the current system requires improvements to reduce the risk of violations and enhance the credibility of the entire supply chain (Kononets *et al.*, 2023, p. 2). Despite high levels of trust in certified organic products in Europe, significant differences exist between countries in preferences for national versus EU certification schemes (Murphy *et al.*, 2022, p. 2).

Research Methodology

The aim of the study was to identify the role of green marketing and the phenomenon of greenwashing in shaping the organic food market in Poland. The research employed the diagnostic survey method, which enabled the collection of data directly from respondents and provided insight into their opinions, knowledge, and attitudes toward issues related to green marketing and greenwashing in the organic food market. The research tool was a proprietary questionnaire, developed based on the literature on the subject and previous studies on consumer behavior in the organic products market (Nestorowicz, 2010, p. 395; Mazur-Wierzbicka, 2022, p. 284).

The study was conducted in the form of an online survey (CAWI – Computer--Assisted Web Interviewing), which allowed for access to a diverse group of respondents and ensured the anonymity of the responses. The questionnaire was distributed via social media and personal contact networks between March and April 2023. A total of 168 individuals participated in the survey, of whom 66.7% were women and 33.3% men. The questionnaire consisted of 15 closed and semi-open questions. The questions were designed to allow for both quantitative analysis and interpretation in the context of the existing body of literature. Basic descriptive statistical methods were used in the data analysis: structural indicators and means were calculated, and relationships between variables were examined (Grzybowska-Brzezińska, 2020, p. 114). The sample selection was non-random and purposive, targeting individuals who expressed interest in the topic of organic food or declared that they purchase such products.

Results

The conducted survey enabled an assessment of consumer awareness levels, their trust in marketing activities, and their experiences with greenwashing in the organic food market. The results indicate varied levels of knowledge and attitudes among respondents regarding issues related to green marketing.

The study revealed familiarity with the concept of greenwashing, analyzed by gender and level of education The concept of greenwashing was incorrectly defined by 23.8% of respondents, which indicates a low level of public awareness in this area. The highest percentage of correct responses was recorded among women with higher education (35.7%) and men with higher education (13.5%) (Tab. 1).

Table 1

The definition of greenwashing in public opinion

Sex	Education	Correct definition	Wrong definition
		%	
Female	higher	35.7	8.4
	secondary	14.6	8.3
	vocational	1.0	0.0
	primary	1.0	2.0
Male	higher	13.5	2.1
	secondary	8.3	2.0
	vocational	2.1	1.0
	primary	0.0	0.0

Source: developed by author.

Another area of the study focused on the motives for purchasing organic food. The most frequently cited reason for choosing such products was concern for personal and family health, indicated by 74.0% of respondents, along with health-related benefits (64.6%). Other commonly mentioned motives included better product quality (48%) and concern for the environment (43.7%) (Fig. 1).

The study also made it possible to identify the main barriers limiting the purchase of organic food. The most frequently cited obstacle was the high price, indicated by as many as 88.2% of respondents. Other significant barriers included attachment to existing dietary habits (54.2%) and limited product availability (52.4%). A lack of trust was mentioned by 19.7% of respondents. The findings indicate that economic factors and a lack of credibility remain key challenges in the organic food market (Fig. 2).

Particular attention should be given to the data concerning consumers' experiences with greenwashing. Exactly 35.4% of respondents stated that they had encountered cases of greenwashing in the organic food market, most often pointing to discrepancies between producers' claims and their actual practices, as well as a lack of credibility confirmed by certifications. The findings confirm that greenwashing poses a threat to consumer trust and the development of the organic products market (Fig. 3). Respondents also identified their preferred places for purchasing organic food (Fig. 4).

Supermarkets were the most commonly chosen (68.8%), followed by marketplaces (61.4%) and organic stores (42.6%). Only 13.5% of respondents declared shopping at organic bazaars, indicating the limited popularity of this sales channel within the organic food market. To increase consumer interest in such products, green marketing should be more effective, credible, and based on reliable information, as organic food – despite increasing public awareness – still reaches a relatively narrow group of consumers.

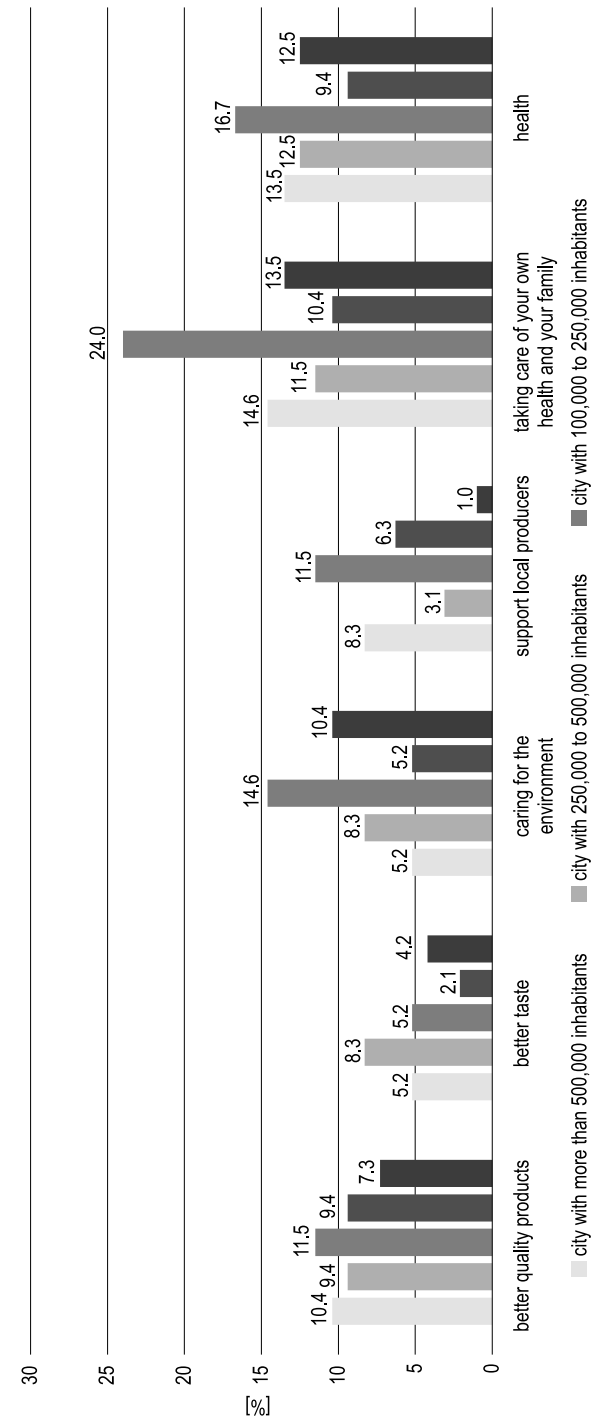

Fig. 1. Motivations for purchasing organic food as indicated by respondents [%]

Source: developed by author.

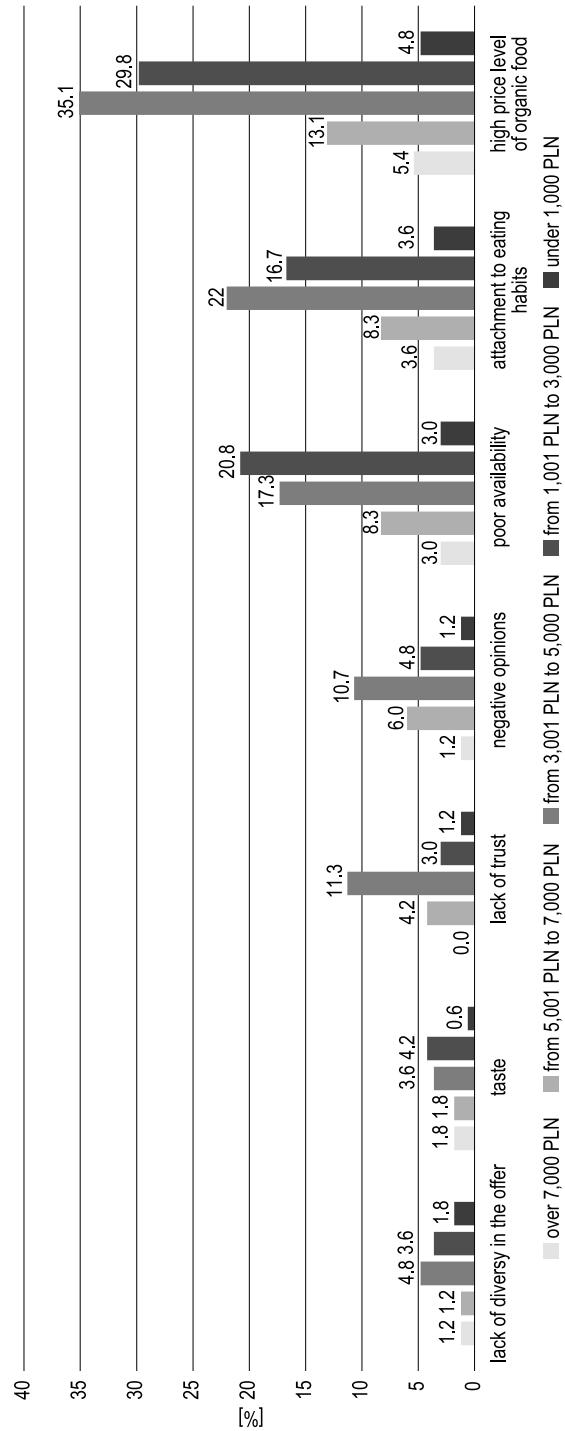

Fig. 2. Barriers to purchasing organic food according to respondents [%]

Source: developed by author.

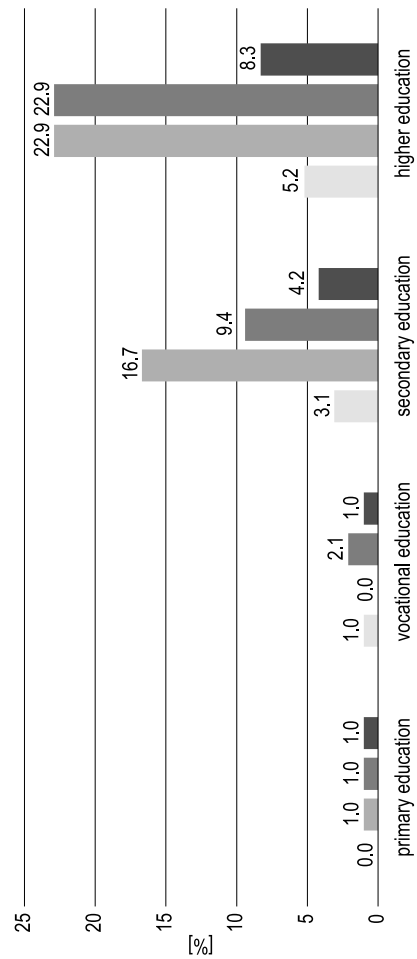

Fig. 3. Respondents' experiences and observations related to greenwashing [%]
Source: developed by author.

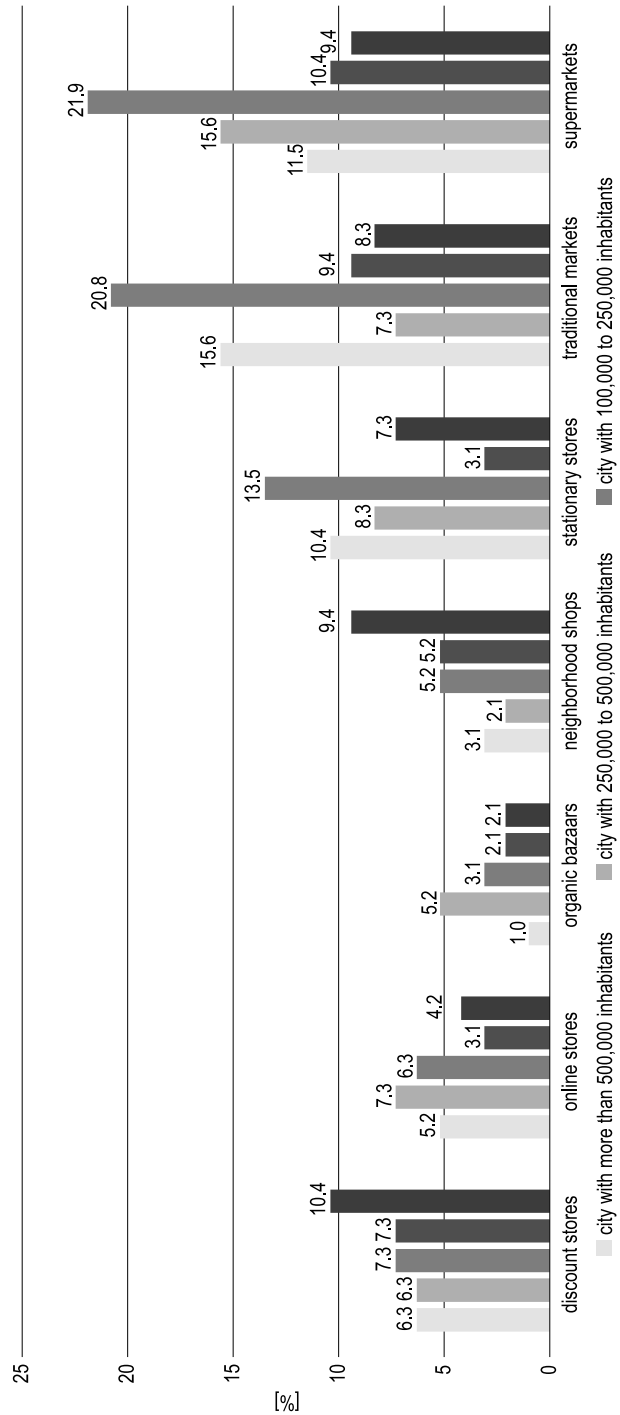

Fig. 4. Preferred places for purchasing organic food according to respondents [%]

Source: developed by author.

Conclusion

Based on the conducted research, it can be concluded that green marketing plays a significant role in shaping the food market; however, its effectiveness is limited by the low level of public awareness and a lack of trust in marketing messages. The phenomenon of greenwashing, which respondents perceive as widespread and associated with discrepancies between producers' claims and reality, poses a serious threat to consumer trust and hinders the development of the organic products market. Ecological certifications and transparent marketing communication play a key role in building trust. At the same time, the low level of awareness of the concept of greenwashing and the relatively high percentage of respondents reporting negative experiences with this phenomenon confirm the need for educational and regulatory actions aimed at strengthening consumer protection and promoting authentic pro-environmental initiatives.

The study confirms growing consumer interest in organic food; however, purchasing decisions are still strongly limited by economic factors and a lack of trust in producers' claims. The high percentage of individuals declaring contact with greenwashing indicates that it is a real issue that may negatively impact the development of this market segment. In reference to the stated research problem regarding the actual significance of green marketing, it can be concluded that respondents expect greater transparency and credibility in marketing activities, particularly through certification and consistent communication. Addressing the issue of greenwashing should be based on building trust and undertaking genuine, transparent pro-environmental actions.

Translated by Author

References

Alvarado, W., Caicedo-Rolón, Á.J., & Delgado, B.M. (2024). Greenwashing, responsabilidad ambiental y huella de carbono: impacto en la productividad del sector industrial en Cúcuta. Revista Ambiental. Agua. *Aire y Suelo*, *15*(1), 106-121. https://doi.org/10.24054/raaas.v15i1.2920.

Bojanowska, A. (2022). *Marketing ekologiczny – istota i znaczenie*. Warszawa: Wydawnictwo Politechniki Lubelskiej.

Ćalasan, V., Slavković, R., & Rajković, J. (2021). Application of Green Tools in Green Marketing. *Serbian Journal of Engineering Management*, *6*(1), 72-77. https://doi.org/10.5937/SJEM2101073C.

Cappelli, L., D'Ascenzo, F., Ruggieri, R., & Gorelova, I. (2022). Is Buying Local Food a Sustainable Practice? A Scoping Review of Consumers' Preference for Local Food. *Sustainability*, *14*(2), 772. https://doi.org/10.3390/su14020772.

Freitas Netto, S.V. de, Sobral, M.F.F., Ribeiro, A.R.B., & Soares, G.R.D. (2020). Concepts and Forms of Greenwashing: A Systematic Review. *Environmental Sciences Europe*, *32*(1), 1-12. https://doi.org/10.1186/s12302-020-0300-3.

Grzybowska-Brzezińska, M. (2020). *Kanały dystrybucji a rozwój rynku żywności ekologicznej*. Olsztyn: Uniwersytet Warmińsko-Mazurski w Olsztynie.

Hristov, H., Erjavec, K., Pravst, I., Juvančič, L., & Kuhar, A. (2023). Identifying Differences in Consumer Attitudes Towards Local Foods in Organic and National Voluntary Quality Certification Schemes. *Foods*, *12*(6), 1132. https://doi.org/10.3390/foods12061132.

Ihnatenko, O. (2022). Zielony marketing w teorii i praktyce. *Marketing i Rynek*, *3*(75), 25-26.

Kononets, Y., Konvalina, P., Bartos, P., & Smetana, P. (2023). The Evolution of Organic Food Certification. *Frontiers in Sustainable Food Systems*, *7*, 1167017. https://doi.org/10.3389/fsufs.2023.1167017.

Kronenberg, J., & Bergier, T. (2010). *Wyzwania zrównoważonego rozwoju w Polsce*. Kraków: Fundacja Sendzimira.

Kuberska, D., Grzybowska-Brzezińska, M., & Brelik, A. (2020). Shaping Competitiveness Through Policy: The Case of the Organic Food Market. *European Research Studies Journal*, *XXIII*(4), 1334-1354. https://doi.org/10.35808/ersj/1913.

Kuczuk, J. (2022). Postawy konsumentów wobec żywności ekologicznej. *Handel Wewnętrzny*, *2*(387), 9-15.

Mahmoud, M.A., Seidu, A.S., Tweneboah-Koduah, E.Y., & Ahmed, A.S. (2024). Green Marketing Mix and Repurchase Intention: The Role of Green Knowledge. *African Journal of Economic and Management Studies*, *15*(3), 501-518. https://doi.org/10.1108/AJEMS-04-2023-0137.

Mahmoud, T.O. (2018). Impact of Green Marketing Mix on Purchase Intention. *International Journal of Advanced and Applied Sciences*, *5*(2), 127-135.

Mazur-Wierzbicka, E. (2022). Greenwashing jako wyzwanie współczesnego marketingu. *Marketing Ekologiczny*, *4*(98), 284-290.

Murphy, B., Martini, M., Fedi, A., Loera, B. L., Elliott, C. T., & Dean, M. (2022). Consumer Trust in Organic Food and Organic Certifications in Four European Countries. *Food Control*, *133*, 108484. https://doi.org/10.1016/j.foodcont.2021.108484.

Nestorowicz, R. (2010). Marketing produktów ekologicznych. *Handel Wewnętrzny*, *6*(357), 395-402.

Qayyum, A., Wang, H., Li, L., & Bhutta, M.K.S. (2023). Green Marketing and Consumer Behavior: A Review of the Literature. *Sustainability*, *15*(1), 289. https://doi.org/10.3390/su15010289.

Somany, N. (2023). Greenwashing in Business: Examining the Impact of Deceptive Environmental Claims on Consumer Behavior and Corporate Accountability. *International Journal of Social Science and Economic Research*, *8*(04), 908-920. https://doi.org/10.46609/ijsser.2023.v08i04.024.

Vangeli, A., Małecka, A., Mitręga, M., & Pfajfar, G. (2023). From Greenwashing to Green B2B Marketing: A Systematic Literature Review. *Industrial Marketing Management*, *115*, 281-299. https://doi.org/10.1016/j.indmarman.2023.10.002.

Wang, C.H., & Juo, W.J. (2024). Sustainable Environmental Performance: The Mediating Role of Green Reputation in the Choice of Green Marketing or Green Demarketing. *Corporate Social Responsibility and Environmental Management*, *31*(3), 1756-1768. https://doi.org/10.1002/csr.2658.

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ORIGINAL PAPER

ENVIRONMENTAL AWARENESS AND STUDENTS' PURCHASING DECISIONS

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JEL Classification: Q18, C83.

K e y w o r d s: ecology, environmental awareness, purchasing decisions.

A b s t r a c t

The main aim of the research was to identify the impact of students' environmental awareness on their decision-making process when making purchases. In order to effectively and comprehensively achieve the intended purpose of the research, a diagnostic survey method was used. The research tool was a survey questionnaire developed using the Google Forms tool. The survey made it possible to determine the level of students' environmental awareness and to present their attitudes and behaviours when making purchasing decisions. Knowledge of students' level of environmental awareness will allow an assessment of whether and to what extent environmental awareness translates into actual consumer behaviour and purchasing decisions. It will enable an understanding of the dynamics of change in the transition to sustainable consumption and an understanding of the factors that can have a significant impact on increasing the consumption of green goods.

ŚWIADOMOŚĆ EKOLOGICZNA A DECYZJE ZAKUPOWE STUDENTÓW

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S ł o w a k l u c z o w e: ekologia, świadomość ekologiczna, decyzje zakupowe.

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Abstrakt

Głównym celem badań było rozpoznanie wpływu świadomości ekologicznej studentów na ich proces decyzyjny podczas zakupów. Do skutecznej i kompleksowej realizacji zamierzonego celu badań wykorzystano metodę sondażu diagnostycznego. Narzędziem badawczym był kwestionariusz ankietowy opracowany za pomocą narzędzia Formularze Google. Badanie pozwoliło na określenie poziomu świadomości ekologicznej studentów oraz zaprezentowanie ich postaw i zachowań podczas podejmowania decyzji zakupowych. Wiedza o poziomie świadomości ekologicznej studentów pozwoli na ocenę, czy i w jakim stopniu świadomość ekologiczna przekłada się na rzeczywiste zachowania konsumenckie oraz decyzje zakupowe. Umożliwi to zrozumienie dynamiki zmian w przejściu do zrównoważonej konsumpcji oraz poznanie czynników mogących mieć istotny wpływ na zwiększenie konsumpcji dóbr ekologicznych.

Introduction

Environmental awareness plays an increasingly important role in consumer choices. It is shaped by a number of factors, not only psychological, but also social and economic factors leading to pro-environmental attitudes and behaviour (Kramer *et al.*, 2005, p. 114-118). Environmental awareness is considered to be one part of ecological literacy which is a combination of motivation and ecological knowledge to understand the effects of people's actions in the context of the environment or an individual's ability to perceive the links between human activity, environmental quality and willingness to engage in activities to protect the environment including purchasing decisions (Geng & He, 2021, p. 4).

Historically, the first definition of the concept of ecology was introduced to science in 1869 by Ernest Haeckel (Spooner, 1984, p. V; Korporowicz, 2000, p. 9). According to Haeckel, ecology is understood as knowledge related to the economics of nature – the study of the relations of plants and animals with their organic and inorganic environment, including, above all, their friendly and hostile relations with those animals and plants with which they come into direct or indirect contact (Fiedor *et al.*, 2013, p. 116-139). This was as late as the 19th century. As a result of the lack of ability, at that time, to build synthetic hypotheses on interspecies interactions, especially between plants and animals, two ecologies were formed: plant and animal ecology. In the first half of the 20th century, a general ecology was formed as a result of advances in knowledge. Biologists define the term ecology as a branch of biology whose task is to study the effects of the environment on organisms and biocoenoses and the effects of organisms on the environment, as well as the structure and functioning of natural systems (Lonc & Kantowicz, 2005, p. 6). General ecology was only followed by social ecology, which was the starting point for environmental management. Kozlowski (2000, p. 41-44) wrote explicitly that ecology is the science of the economics of nature that studies the relationships between organisms and between organisms and the environment (Witkowska-Dąbrowska, 2022, p. 62).

Taking into account the progressing climate crisis, the deepening pollution of waters with microplastics, the scarcity of good quality water, air pollution and others, it is worth considering the level of ecological awareness of the young generation and what choices they make when making purchasing decisions, what they are actually guided by, how they evaluate their knowledge of ecology and what determines the final choice of a product, does ecology have any influence on this?

Literature Review

Decision-making is one of the elements of human behaviour that one encounters in both everyday and professional life (Rebizant, 2012, p. 5). They may concern different aspects of his or her existence and have varying degrees of importance, in relation to the consequences they may have in one's life, causing both long-term changes and those that do not have a significant impact on the individual's life (Rudnicki, 2000, p. 188). In the dictionary of the Polish language, a decision is defined as 'a conclusion resulting from a choice' (*Decyzja*, 2025), and therefore it is important to know the factors that can influence an individual's decision-making process. However, it should be remembered that although decision-making is determined by many variables, the main goal of the individual facing the decision is to fulfil the needs he/she feels (Łaguna & Rudzewicz, 2002, p. 74, 75). We can distinguish four types of decisions, which include: deliberative decisions, non-routine decisions, habitual decisions, and impulsive decisions. Deliberative decisions are characterised by the consumer considering a number of different possibilities and then choosing the one that, in his/her opinion, is best able to satisfy his/her needs, taking into account his/her views, personal beliefs and priorities, as a result of which the individual goes through all phases of the decision-making process (Kieżel, 2000, p. 83, 84). Non-routine decisions, during which the consumer makes a choice based on the opinions of friends, recommendations, experience and time pressure, are another situation. They usually refer to products that have been bought before (Witek, 2007, p. 17). Habitual decisions are based on the consumer's repetition of purchase decisions that he or she has already made many times before, a fact that shortens the time and decision-making process, guaranteeing ease and speed in decision-making. They occur during purchases that we make regularly or every day, when we choose products that we know and have tried before (Adamowicz & Krasuska, 2016, p. 177, 178). The last type of decision is the so-called impulsive decision, which consists of making a decision without a prior plan, and most often involves products that are small in size and have an attractive price (Adamowicz & Krasuska, 2016, p. 177, 178). Environmental awareness is considered to be one part of ecological literacy which is a combination

of motivation and ecological knowledge to understand the effects of people's actions in the context of the environment, or an individual's ability to see the links between human activity, the quality of the environment and the willingness to engage in actions to protect the environment (Geng & He, 2021, p. 4; Kwitek & Skiba, 2017, p. 129).

Two approaches to environmental awareness can be found in the literature (Papuzinski, 2006, p. 35), namely a narrow and a broad approach. The narrow approach presents environmental awareness as a group of elements that include knowledge, views and ideas about the environment, while the broad approach defines the term as "the totality of recognised ideas, values and opinions about the environment as a place for human (society) life and development". A consumer who places a high value on the environment is characterised by an awareness of the impact of his or her choices on the natural environment (Handayani *et al*., 2021, p. 170, 171). Pro-environmental actions manifest themselves in the so-called greening of consumption, which consists in satisfying the consumer's needs with goods and services characterised by the absence of harmful effects on the environment, a term that can manifest itself, among other things, through the economical use of goods, as well as the reduced consumption of products whose manufacture involves the use of non-renewable resources, the purchase of goods that leave behind a minimum amount of consumption waste and the purchase of environmentally friendly products that have a limited negative impact on the environment (Patrzałek, 2016, p. 160). The environmentally responsible consumer (Pabian, 2013, p. 189) seeks to reduce consumption by reaching for sustainable, economical and recyclable products (Tarapata, 2020, p. 210, 211). Consumers' environmental awareness stimulates their interest in the topic of the environment, as a result of which the consumer shifts from selfish satisfaction of his/her own needs to behaviours that have a positive impact on the environment. This is reflected in consumer behaviour and decisions, which are the result of consumers perceiving the purchase of a green product as having a real impact on protecting the environment and preventing its degradation (Tarapata, 2015, p. 54, 55).

Environmental awareness is shaped by a number of factors, not only psychological, but also social and economic factors leading to pro-environmental attitudes and behaviour (Kramer *et al*., 2005, p. 114-118).

Methodology of Research

The research was conducted using a diagnostic survey method. The research tool was a survey questionnaire developed using the Google Forms tool. It contained a total of 13 questions and consisted of 1 open-ended question and 12 closed questions including 11 single-choice questions and 1 question where respondents could mark more than one answer. The survey was conducted

via Internet, using the purposive selection technique with the snowball method from the student population of the University of Warmia and Mazury in Olsztyn. Eighty-five respondents took part in the study. After analysing the questionnaires, they were divided into three research groups according to their fields of study: I (35): Economics, Management, Management and Production Engineering, Logistics; II (34): Medicine, Nursing, Physiotherapy, Environmental Protection, Forestry, Zootechnics, Animals in Recreation, Education and Therapy, Engineering in Logistics, Veterinary Medicine, Food Technology and Human Nutrition, Construction and Computer Science; III (31): Law, Pedagogy, Psychology, Logopedics, Administration, Analytics and Public Management, Homeland Security and Criminology.

Results of Own Research

The survey showed that for 6% of respondents ecology is of no importance, while for 7% it is of little importance and for only 9% it is of very high importance. The results show that ecology is most important for group II, where 21% of respondents rated its importance at 7 and only 3% considered it unimportant (Fig. 1). Group I was dominated by a rating of 6 (20%), with 7% giving no importance to ecology. Group III indicated the highest rating (9) in some respondents, but as many as 12% considered ecology unimportant, with ratings of 4 and 5 dominating.

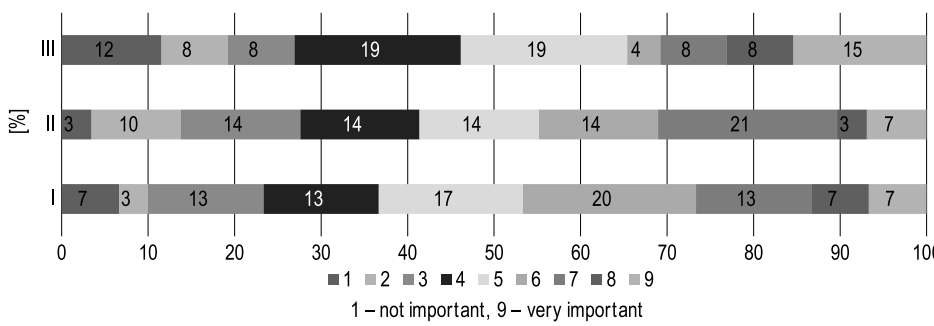

Fig. 1. Share of indications regarding the importance of ecology for the three groups of respondents

Source: own elaboration based on survey.

Respondents also rated their environmental knowledge (Fig. 2). Most respondents (22%) found it to be good, while 4% and 12% found it to be high and very high. A low level of knowledge was declared by 6% of respondents, while more than 50% described their knowledge as moderate. More than 66% of group I respondents rated their knowledge as at least moderate and only 7% as low.

In group II, 24% of students declared very high ecological knowledge, but 20% rated it as very low or low. The lowest level of ecological knowledge was indicated in group III, where 38% of students describe it as low or very low, which may be due to less emphasis on ecology in their education. Group III includes students in the humanities, pedagogy and law. The results may suggest that although group I does not attribute the greatest importance to ecology, they may have more frequent contact with theoretical knowledge, which influences a higher level of ecological knowledge. Group II, although declaring a high importance of ecology, shows more variation in the evaluation of their knowledge, which may be due to individual interests. The results may also be a result of the students' subjective self-assessment, whose level of self-confidence may have influenced the over- or under-assessment of their own ecological knowledge. Respondents rated their ecological knowledge on a nine-point scale (1 – no knowledge, 9 – very high knowledge). The largest number of respondents (22%) rated it as good, while 4% and 12% rated it as high and very high. A low level of knowledge was declared by 6% of respondents, while more than 50% described their knowledge as moderate.

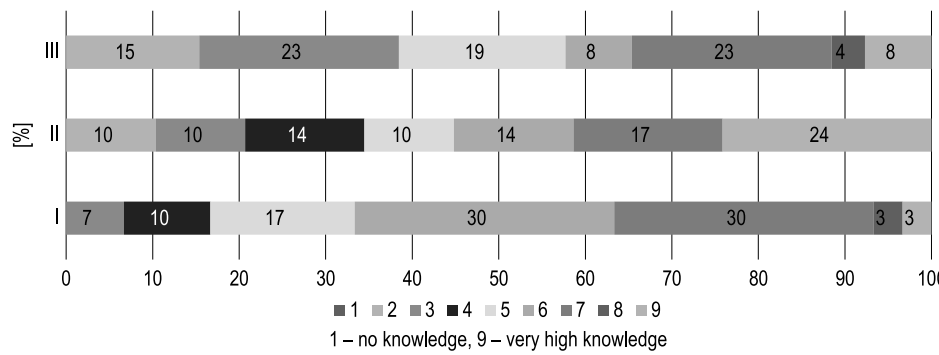

Fig. 2. Share of indications concerning environmental knowledge in three groups of young respondents

Source: own compilation on the basis of surveys.

The sources from which respondents derive their knowledge of ecology are also an important theme in the research (Fig. 3). A multiple-choice question was asked to explore these. The results indicate that the Internet (85%) and social media (76%) currently play a key role in providing information that is a source of knowledge and contributes to the environmental awareness of society.

The research also addressed the impact of product attributes on purchase decisions. The focus was on attributes such as availability, price, quality, brand, product composition, organic packaging and organic origin of the product. Respondents were asked to use a nine-point scale to rate the influence of a given attribute on their decision to purchase a product, with 1 meaning the attribute has no influence and 9 meaning it has a very strong influence (Tab. 1).

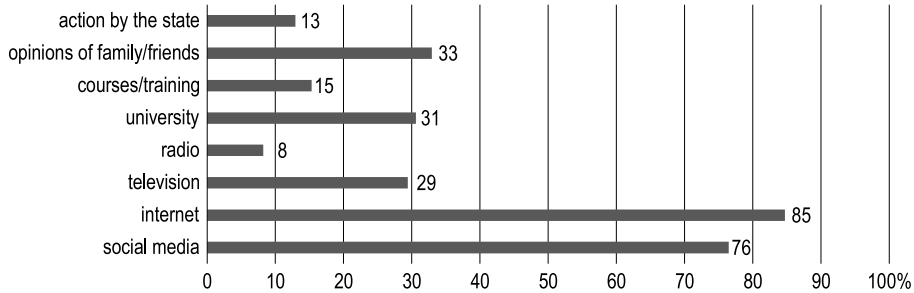

Fig. 3. Share of indications of respondents' sources of ecological knowledge
Source: own elaboration based on survey.

Table 1

Influence of product characteristics on purchase decisions [%]

Feature	Impact assessment									
	1	2	3	4	5	6	7	8	9	total
Availability	1	5	6	7	8	5	16	18	34	100
Price	1	2	7	5	5	5	9	22	44	100
Quality	0	1	4	7	2	6	20	19	41	100
Brand	9	9	12	11	15	19	15	6	4	100
Product composition	0	2	4	9	8	13	19	16	28	100
Ecological packaging	11	15	15	11	9	9	12	8	9	100
Organic origin of the product	7	14	14	11	14	9	9	11	11	100

Source: own elaboration based on research.

The research showed that for the consumers the very strong influence on their purchasing decision have following features: availability (34%), price (44%) and quality (41%). In the highest category their received the most indications, which is in line with the behavioural economics literature. According to Kahneman and Tversky's prospect theory, consumers have a loss-avoidance and preference for benefits, resulting in quality increasing satisfaction, price influencing perceived value and availability facilitating choice (Solek, 2010, p. 24-26).

Environmental aspects, such as packaging or product origin, were considered less important than the above-mentioned characteristics (20% in total in the highest category), which may indicate the priority of financial considerations in purchasing decisions. Consumers do not always see the long-term benefits of green choices, such as the impact on health or savings. For green to become a key purchasing factor, it needs to coexist with availability, price and quality, which, according to the survey, have the greatest impact on consumer choices.

Students were asked to indicate their willingness to pay a higher price for organic products (Fig. 4). However, it should be borne in mind that respondents

who declared a willingness to pay a high price difference between organic and standard products are also able to purchase the product at a lower price. The survey showed that the vast majority of respondents, i.e. 79%, are willing to pay up to 10% more for organic products. A significant proportion of respondents accepts a price difference of up to 20% (52%) and up to 30% (28%). The willingness to pay a higher difference (above 40%) is minimal – only 2% in summary. Additionally, 21% of students said they would not buy an organic product if it was more expensive. The results suggest that price is one of the limiting factors for green choices, and that the most reasonable price difference, accepted by most consumers, is a price higher up to 10%.

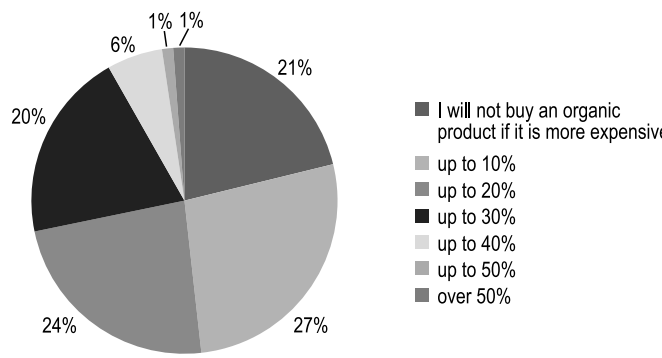

Fig. 4. Share of indications regarding respondents' willingness to pay a higher price for an organic product
Source: own elaboration based on survey.

Students were also asked how they rated the importance of eco-labels in their purchasing decisions. When comparing the results across the three groups of students (Fig. 5), it should be noted that group III had the highest percentage of students (27%) rating the importance of eco-labels as important and very important, and it should also be noted that group III has the lowest percentage of respondents for whom eco-labels have no or very little importance. For respondents in group II, the importance of eco-labels is more varied. The most frequently selected responses to 3, 4 and 7 (17% each), suggesting a moderate interest in eco-labelling. For group I, up to 27% of students find ecolabels moderately important. It should be remembered that group one is made up of economics and management students, which makes them aware of the importance of ecolabels in their purchasing decisions. Thanks to their knowledge, they understand that eco-labels can testify to a product's conformity with consumer values and influence its perceived value, making them an important element of choice. This distribution of results, may suggest that even though students in research group III declare the least environmental knowledge among the surveyed collective, both the individual views of the group and the desire

to protect the environment make students pay attention to eco-labels of products rather than basing their choices of goods on their environmental knowledge. For groups I and II, eco-labels are less important, probably due to their higher ecological knowledge, which is more important to them than eco-labelling, and they therefore make their choices based on their knowledge rather than solely on the label.

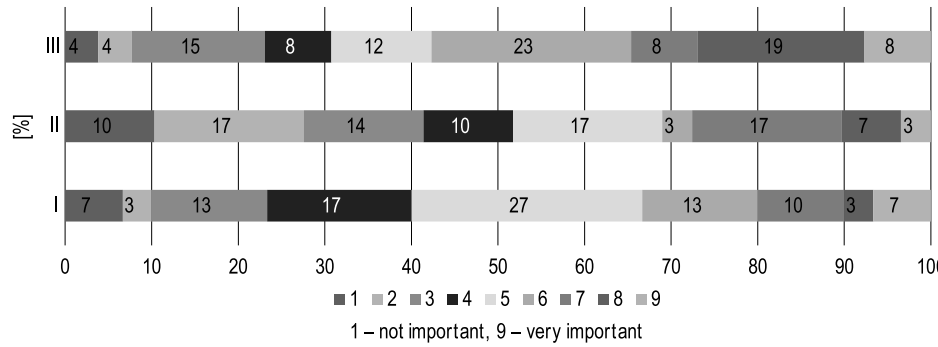

Fig. 5. Share of indications regarding the importance of eco-labels in different groups of students

Source: own elaboration based on survey.

The research indicates that 52% of young respondents have at least once refrained from buying a product that has a negative impact on the environment, a point that suggests that ecology has some importance in their purchasing decisions for only half of the respondents. Ecological factors are not a sufficient reason to abandon a purchase, suggesting that the ecological aspect is not dominant in consumer preferences. If one looks at the frequency of abandonment of purchases of organic products in the different student groups, it can be seen that for each of the three groups the responses are almost identical. Almost 50% of the respondents in each group indicated that they had never given up buying a product because of its negative environmental impact, while the remainder of each group (around 50% each), declared that there had been a situation in their life where they had given up buying a product for this reason (Fig. 6).

An aspect worth noting is also the frequency of the decision to buy organic products. The study used a nine-point scale (1 – I do not buy, 9 – I always buy). Only 6% of respondents always buy organic products and 13% do so very rarely or not at all. The largest percentage (26%) declares that they buy them quite often. For the others, a moderate interest in organic products was noticed, which means that these products are present in their lives, but do not play an important role. Considering the student groups, it can be seen that respondents belonging to groups I and II are characterised by a similar interest in organic products (Fig. 7). The results show that for both respondents of group I consisting

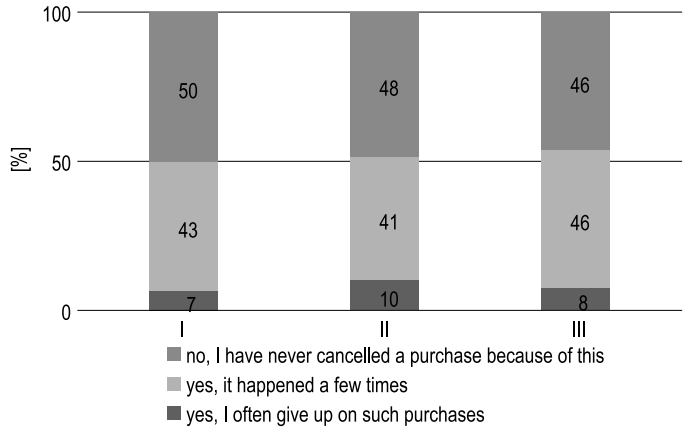

Fig. 6. Share of indications regarding frequency of resignations from non-ecological goods purchases in different groups of students

Source: own elaboration based on survey.

of business and economics students and group II including students of medical, natural sciences and technical sciences, the frequency of purchase of organic products is moderate (37% and 31%), this means that consumers choose organic goods but they are not a major part of their daily life. It should be noted that both groups rated their ecological knowledge as relatively high, which may be the main reason for choosing organic products. In addition, in the case of group II, ecology appeared to be the most important of all the groups surveyed, which may indicate a greater environmental awareness and stronger environmental priorities. Against the background of the two groups above, group III looks worse, in which, although a significant percentage of respondents always buy organic products, in total as much as 35% of the group hardly buys them at all, which may be due to the lower ecological knowledge of group III.

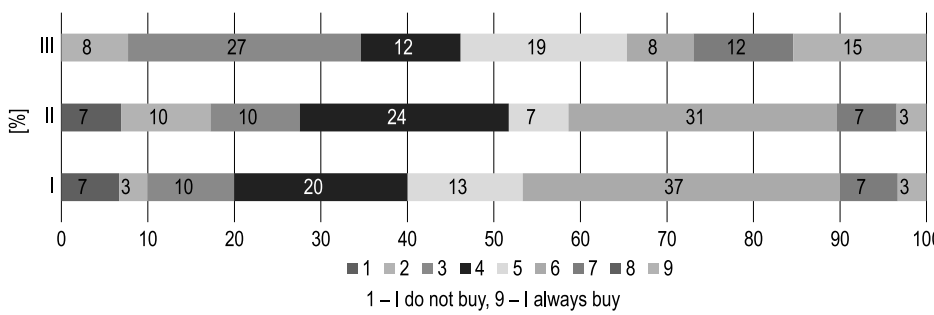

Fig. 7. Share of indications regarding the frequency of purchase of organic products in individual student groups

Source: own elaboration based on research.

Respondents who rated the frequency of their choice of organic products between 2 and 9 were asked to indicate what prompted their purchase (Tab. 2). A scale of 1-9 was used, where 1 indicated no importance and 9 indicated very high importance. The absence of harmful substances was one of the most important reasons (63% indicating 9, 8 and 7), as were health reasons (60%). Recommendations from friends and family were less important, which may be due to social relationships or trust. Caring for the environment was of varying importance (33% indicating high importance, 35% indicating low importance), which may reflect differences in environmental values and awareness. Random choice was the least influential (44% indications of 1, 2 and 3), suggesting that purchasing decisions were informed and thoughtful.

Table 2

Respondents' reasons for purchasing an organic product [%]

Rationale for buying an organic product	Rating scale									
	1	2	3	4	5	6	7	8	9	total
Caring for the environment	3	16	16	5	14	14	9	11	13	100
Health considerations	1	8	8	9	6	9	16	14	30	100
Recommendations from friends/family	14	4	14	14	9	9	14	11	13	100
No harmful substances	1	5	10	9	4	9	11	28	24	100
Random selection	23	11	10	8	15	5	6	10	13	100

Source: own elaboration based on research.

Respondents were asked about features that could increase consumption of green goods (Tab. 3), rating them on a scale of 1-9 (1 – definitely will not increase, 9 – will increase very much). According to the gathered data from the research, for the consumers the feature which could have the highest influence on ecological goods consumption is lower price (81% of indications in summary, including "7 – will increase, 8 – will increase much, 9 – will increase very much"), which definitely would influence consumers' purchasing decisions. It confirms the importance of economic motivators in consuming ecological products. According to young respondents the second feature which would have significant influence on consumption increase is better availability, which received 67% of indications in summary in following categories: "7 – will increase, 8 – will increase much, 9 – will increase very much" consumptions of ecological goods, suggesting that easier access favours environmentally friendly choices. According to the respondents also more product information (54% in summary, including 7, 8 and 9) and better labelling (52% in summary, including 7, 8 and 9) could be an relevant factor contributing to increase in consuming ecological products. The least influential, according to the respondents, are dedicated places for selling organic products.

Table 3

Factors likely to increase consumption of green goods [%]

Feature	Rating scale									
	1	2	3	4	5	6	7	8	9	total
Lower price	0	1	4	9	0	5	7	9	65	100
Improved accessibility	0	2	4	8	8	11	8	19	40	100
Improved signage	2	6	8	9	13	9	14	13	25	100
Purchase point for organic products only	14	13	14	12	8	7	11	4	18	100
More information on organic products	2	1	12	9	12	9	12	19	24	100

Source: own elaboration based on research.

Summary

Conducted research, despite having restrictions resulting from small research sample size and applicated method of its selection, allowed on formulation relevant conclusions regarding analysed problem. Although results can not be fully generalised to the whole population, gathered data and observations delivered valuable information, which can constitute starting point for future, more deepened researches.

The survey showed that environmental awareness has a significant impact on students' purchasing decisions, although the mere presence of environmental aspects in products is not always enough to make a decision about their choice. More than half of the respondents rate their environmental knowledge at least average, suggesting that environmentally aware consumers are present among the respondents. Respondents to the survey mainly derive their knowledge of ecology from the internet and social media.

The analysis showed that the environmental aspects of the products are not a sufficient factor to induce consumers to purchase the product. However, it was noted that the most important attributes of goods inducing students to purchase them are availability, price and quality. Therefore, it can be presumed that if ecological attributes were combined with availability, attractive price or quality, consumption of goods could change positively – increase.

Students pay attention to the organic labelling of products, and half of them abandon the purchase if the product does not meet organic requirements. The frequency of purchase of organic products is high, and the most important premises favouring their purchase are the absence of harmful substances and health reasons. Additionally, respondents identified reasons that could increase the consumption of organic goods, which are mainly lower price, better availability and more information about organic products

Among the three groups of students analysed, differences in perception of ecology were noted. Group II (medical, natural sciences and technical faculties) shows the highest concern for ecology, while group I (economics and management) rates its ecological knowledge highest. Group III (humanities and social sciences), despite attaching great importance to ecological signs, is characterised by the lowest rating of its ecological knowledge. These differences are due to the nature of the fields of study and their relationship to ecology. Students in natural and medical sciences have a better understanding of the impact of ecology on health and the environment, which leads them to be more concerned about these issues, while students in economics and management analyse ecology mainly in the context of the economy and the market. Humanities and social sciences majors may offer fewer opportunities to explore environmental issues, which may explain their students' lower level of knowledge.

Translated by Author

References

Adamowicz, M., & Krasuska, A. (2016). Komunikacja marketingowa a zachowania nabywców na rynku towarów konsumpcyjnych. *Nierówności Społeczne a Wzrost Gospodarczy*, *45*(1), 173-185.

Decyzja. (2025). Słownik języka polskiego PWN. https://sjp.pwn.pl/sjp/decyzja;2554338.html.

Fiedor, B., Dokurno, B., & Scheuer, B. (2013). Status badawczy ekonomii ekologicznej jako współczesnej heterodoksji ekonomicznej. *IX Kongres Ekonomia Przyszłości*. Wrocław: Polskie Towarzystwo Ekonomiczne.

Geng, M.M., & He, L.Y. (2021). Environmental Regulation, Environmental Awareness and Environmental Governance Satisfaction. *Sustainability*, *13*, 3960. https://doi.org/10.3390/su13073960.

Handayani, W., Ritomiea Ariescy, R., Cahya, F.A., Yusnindi, S.I., & Sulistyo, D.A. (2021). Literature Review: Environmental Awareness and Pro-Environmental Behavior. *Nusantara Science and Technology Proceedings*, 170-173. https://doi.org/10.11594/nstp.2021.0925.

Kieżel, E. (2000). *Rynkowe zachowania konsumentów*. Warszawa: Wydawnictwo Akademii Ekonomicznej w Katowicach.

Korporowicz, V. (2003). Ekonomia środowiska – współczesna nauka z tradycjami. *Studia Ecologiae et Bioethicae*, *1*, 329-340.

Kozłowski, S. (2000). *Ekorozwój – wyzwanie XXI wieku*. Warszawa: Wydawnictwo Naukowe PWN.

Kramer, M., Urbaniec, M., & Kryński, A. (2005). *Międzynarodowe zarządzanie środowiskiem. Interdyscyplinarne założenia proekologicznego zarządzania przedsiębiorstwem*. Warszawa: C.H. Beck.

Kwitek, A., & Skiba, M. (2017). Świadomość ekologiczna młodych ludzi. *Zeszyty Naukowe Politechniki Częstochowskiej. Zarządzanie*, *28*(2), 127-136. https://doi.org/10.17512/znpcz.2017.4.2.10.

Lonc, E., & Kantowicz, E. (2005). *Ekologia i ochrona środowiska*. Wałbrzych: Wydawnictwo Państwowej Wyższej Szkoły Zawodowej im. Angelusa Silesiusa.

Łaguna, M., & Rudzewicz, A. (2002). *Marketing i sprzedaż*. Olsztyn: Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego.

Pabian, A. (2013). Zrównoważona konsumpcja w społeczeństwie przyszłości. *Handel Wewnętrzny*, *4*.

Papuziński, A. (2006). Świadomość ekologiczna w świetle teorii i praktyki (zarys politologicznego modelu świadomości ekologicznej). *Problemy Ekorozwoju*, *1*(1), 33-40.

Patrzałek, W. (2016). Proekologiczne zachowania gospodarstw domowych. *Marketing i Zarządzanie*, *3*(44), 157-166.

Rebizant, W. (2012). *Metody podejmowania decyzji*. Wrocław: Oficyna Wydawnicza Politechniki Wrocławskiej.

Rudnicki, L. (2000). *Zachowanie konsumentów na rynku*. Warszawa: Polskie Wydawnictwo Ekonomiczne.

Solek, A. (2010). Ekonomia behawioralna a ekonomia neoklasyczna. *Zeszyty Naukowe*, *8*, Polskie Towarzystwo Ekonomiczne, Uniwersytet Ekonomiczny w Krakowie.

Spooner, B. (1984). *Ecology in development: A rationale for three-dimensional policy*. Tokyo: The United Nations University.

Tarapata, J. (2015). Konsumpcja zrównoważona a proekologiczne zachowania konsumentów. *Nowoczesne Systemy Zarządzania. Modern Management Systems*, *1*, 51-59.

Tarapata, J. (2020). Orientacja na zrównoważoną konsumpcję w zachowaniach młodych konsumentów. *Zeszyty Naukowe WSH. Zarządzanie*, *2*, 207-218.

Witek, L. (2007). *Merchandising. W małych i dużych firmach handlowych*. Warszawa: C.H. Beck.

Witkowska-Dąbrowska, M. (2022). *Kształtowanie środowiska na obszarach wiejskich – w stronę rozwoju trwałego i zrównoważonego*. Olsztyn: Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego w Olsztynie.

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ORIGINAL PAPER

THE ROLE OF TALENT MANAGEMENT IN KNOWLEDGE-BASED ORGANIZATIONS

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JEL Classification: M12, O15, M54, L29.

Key words: talent management, knowledge-based organizations, human capital, employer branding.

Abstract

The aim of this article is to theoretically analyze the specifics of talent management in knowledge-based organizations, with particular emphasis on the factors that determine the effectiveness of this process. The author aims to demonstrate the importance of a strategic approach to identifying, developing, and retaining high-potential employees, as well as to characterize selected talent management models in the context of knowledge organizations. Talent management is a complex and strategic process centered on high-potential human resources. It encompasses both the identification and development of individuals distinguished by special abilities, as well as the design and implementation of organizational processes aimed at their effective acquisition, deployment, retention and further support in their development. The approach also takes into account the necessity of forming long-term relationships with talented individuals - both at the stage before and after the formal establishment of cooperation - as well as taking care of favorable conditions for their functioning within the organization or in a partnership relationship. The article is theoretical in nature and its main purpose is to show the specifics of talent management in the conditions of knowledge-based organizations. It presents the essence of this type of organization and discusses selected models of talent management. Attention was also paid to factors that can significantly limit the effectiveness of the process in question. Among the barriers identified as key are the following: unfavorable employer image in the labor market, trust deficit in intra-organizational relations, limiting the space for cooperation and knowledge exchange between talented employees and the organizational environment, lack of systemic recognition of individual competencies, low level of involvement of top management in talent development issues, creating an atmosphere of employment insecurity, tolerating the presence of people lacking key competencies.

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ROLA ZARZĄDZANIA TALENTAMI W ORGANIZACJACH OPARTYCH NA WIEDZY

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Kody JEL: M12, O15, M54, L29.

Słowa kluczowe: zarządzanie talentami, organizacje oparte na wiedzy, kapitał ludzki, branding pracodawcy.

Abstrakt

Celem artykułu jest teoretyczna analiza specyfiki zarządzania talentami w organizacjach bazujących na wiedzy, ze szczególnym uwzględnieniem uwarunkowań, które determinują skuteczność tego procesu. Autor dążył do ukazania znaczenia strategicznego podejścia do identyfikacji, rozwoju oraz utrzymania pracowników o wysokim potencjale, a także do scharakteryzowania wybranych modeli zarządzania talentami w kontekście organizacji wiedzy. Zarządzanie talentami stanowi złożony i strategiczny proces, którego centralnym punktem są zasoby ludzkie o wysokim potencjale. Obejmuje zarówno identyfikację i rozwój jednostek wyróżniających się szczególnymi zdolnościami, jak i projektowanie oraz wdrażanie procesów organizacyjnych ukierunkowanych na ich efektywne pozyskiwanie, wdrażanie, utrzymanie i dalsze wspieranie w rozwoju. Podejście to uwzględnia również konieczność kształtowania długofalowych relacji z utalentowanymi osobami – zarówno na etapie poprzedzającym formalne nawiązanie współpracy, jak i po jej zakończeniu – a także dbałość o sprzyjające warunki ich funkcjonowania w ramach organizacji lub w relacji partnerskiej. Artykuł ma charakter teoretyczny i jego głównym celem jest ukazanie specyfiki zarządzania talentami w warunkach organizacji bazujących na wiedzy. Przedstawiono w nim istotę tego typu organizacji oraz omówiono wybrane modele zarządzania talentami. Zwrócono również uwagę na czynniki, które mogą w istotny sposób ograniczać efektywność omawianego procesu. Wśród barier identyfikowanych jako kluczowe wymienia się m.in.: niekorzystny wizerunek pracodawcy na rynku pracy, deficyt zaufania w relacjach wewnątrzorganizacyjnych, ograniczenie przestrzeni do współpracy i wymiany wiedzy między utalentowanymi pracownikami a otoczeniem organizacyjnym, brak systemowego uznania dla indywidualnych kompetencji, niski poziom zaangażowania najwyższego szczebla zarządzania w kwestie rozwoju talentów, tworzenie atmosfery niepewności zatrudnienia, tolerowanie obecności osób niemających najważniejszych kompetencji.

Introduction

The modern economy is increasingly referred to as a knowledge-based economy, which is the result of complex and multi-stage transformations initiated in the second half of the 20th century, and particularly intensified in the decade of the 1990s. The key factors determining the transformation of the economic system from an industrial model to a knowledge-based model include the dynamic development of science and technology, the increasing globalization of economic processes, the increase in competitiveness of markets, as well as significant transformations in the functioning of organizations. Of particular importance in this context were the changes brought about by the implementation

of information and communication technologies, the streamlining of corporate organizational structures and the development of new management paradigms. In addition, the increasing instability of the market environment and the socio--educational changes accompanying these processes promoted the intensification of economic activity and entrepreneurship (Golinski, 2018). One of the fundamental hallmarks of the modern knowledge economy is the concept of Industry 4.0, based on the processes of digitization and full integration of the horizontal value chain. The networking of economic activities and the implementation of advanced technologies significantly affect the way businesses operate, as well as the complexity of relationships and dependencies that exist between them (Kott & Bujak, 2018). Although scientific institutions, such as universities and research units, play an important role in the creation of knowledge, increasing importance is attributed to business organizations.

The transformation to a knowledge-based economy, a consequence of the shift away from the industrial paradigm, as well as intensifying phenomena such as the unpredictability of the environment, the rapid development of technology and the escalation of competition at the global level, have forced a change in thinking among both managers and employees. The new realities of organizational functioning require the adoption of a more integrated and systemic approach to management, which takes into account the interdependence of the organization's internal elements and their interconnectedness with the external environment (Nambisan *et al*., 2019). Under conditions of increasing complexity and multidimensionality of organizational processes, cross-cutting thinking and understanding of diversity and variability as natural features of the operating environment of modern enterprises become necessary. Change management is increasingly based on the principle of dynamic acceleration, where each change initiates the next – like a "snowball effect" – which enables faster adaptation and increased competitiveness. In this context, it becomes particularly important to invest in human capital, which is a key resource of the organization. A central role is played here by the so-called knowledge workers and individuals considered talents, whose competencies and creative potential are the foundation of an organization's strategic advantage in the knowledge economy. Today's global economy shows a clear development trend towards a knowledge economy, and in the long run – towards a full knowledge economy model. However, the dynamics of this process is periodically disrupted by phenomena peculiar to the global political-economic and social reality, such as financial crises, regional armed conflicts, increased migration movements, as well as objections to the implemented Green Deal strategies and sustainable development policies. A real transformation towards a knowledge orientation will only be possible when all relevant social groups - including employers and employees, representatives of science and education, political and economic leaders, producers, consumers, government officials, as well as representatives of the agricultural sector – fully realize the nature of the changes taking place and adopt attitudes, values and

models of thinking adapted to the realities of the new era. Knowledge orientation encompasses a set of values, beliefs and principles underpinning the knowledge economy, knowledge-absorbing organizations and contemporary management concepts that place special emphasis on intangible resources, especially those embodied in people – carriers of knowledge, competence and creativity. One of the fundamental concepts operating in this paradigm is talent management, which should be an integral part of the strategy of organizations operating in the reality of the knowledge economy.

Methodology

This article is based on a detailed and synthetic examination of the scientific literature on talent management in knowledge organizations (Lin & Tsai, 2020). Content analysis was applied, focusing on selected scientific publications and conceptual and empirical studies in the fields of human resource management and management management (Kambur & Yildirim, 2023). The literature selection encompassed current relevance, content, and themes relevant to the article. In the case of the source itself, both foreign and theoretical sources were used, which included applications that included theoretical and theoretical approaches. Special attention was paid to peer-reviewed publications classified as well-established in the scientific community. The literature review identified key talent management models and individuals exposed to this process in knowledge organizations. Analysis of the sources also enabled the identification of barriers and constraints that may hinder the effective management of high-powered devices. The collected information was developed and used to draw theoretical conclusions. The literature review included the possibility of occurrence and the application of supplementary gaps in the empirical results.

Literature Review

Enterprises operating in the high-tech sector are most often considered a typical example of knowledge-based organizations. They are characterized by an intense demand for advanced scientific knowledge, a high level of personnel qualification and competent managers. Their functioning is based on the generation, accumulation and transfer of new knowledge, which makes them an important element of the modern knowledge economy (Steinerowska-Streb, 2019). At the same time, organizations of this type can be categorized as learning organizations, in which the processes of learning and knowledge development are continuous and an integral part of operations. Thanks to the use of advanced information technologies, these organizations enter into extensive relations with

the institutional and market environment, often taking the forms of network and virtual organizations, which enables them to achieve their strategic goals flexibly and efficiently. A key element in the functioning of knowledge-based organizations is the knowledge management system, which is the foundation of their long-term development and competitiveness. An important premise of this concept is the belief that every employee – regardless of his or her position – has a real impact on the future of the organization. Therefore, special attention is paid to creating an organizational culture that promotes a passion for learning, continuous improvement of competencies, active participation in shaping development strategies and creative involvement in the realization of organizational goals (Mikula, 2018).

The characteristics of knowledge-based organizations can manifest themselves (Hadad, 2017):

– a focus on creating favorable conditions for cooperation;
– the creation of a culture of a community of professionals, affirming dialogue;
– dominant assets are knowledge and intellectual resources;
– working closely with partners based on trust and engaging customers;
– the principle of systems thinking;
– participation of employed people in the management of the company;
– developed incentive systems, not only monetary;
– autonomy of people;
– organization and availability of knowledge;
– interaction in the business ecosystem;
– evaluation of organizational performance based on indicators.

One of the key differentiators of knowledge-based organizations is their ability to establish and maintain collaborative relationships with a variety of external entities. Such relationships take the form of sophisticated strategic organizational arrangements, such as alliances, joint ventures, coalitions, consortia, holding companies, outsourcing models, franchise systems or other forms of cooperative cooperation. Contemporary knowledge management, implemented within such structures, focuses on the joint use of intangible resources, including knowledge, human capital and technology. It also includes the sharing of intellectual property rights, which enables not only the efficient use of owned resources, but also significantly reduces the risks and individual costs of implemented projects (Powichrowska, 2018).

The concept of talent management does not have a uniform definition and is interpreted in different ways by both practitioners and management theorists however it is also closely related to human resource management (Jurek, 2023). For some, it means a systemic process aimed at attracting new employees, integrating them into the organization, and developing and retaining existing human resources. In this view, the central goal is to identify individuals characterized by above-average professional potential, considered a manifestation of talent in the context of the organizational function, but also one in which

intensified participatory activities take place (Jurek, 2023). Other approaches, on the other hand, emphasize a more inclusive perspective, according to which talent management refers to the entire population of employees, assuming that each person has unique abilities and predispositions, which – after appropriate diagnosis and support – can be developed and used effectively. In this view, talent management is the process of recognizing, activating and optimally utilizing the potential inherent in each member of the organization, regardless of his or her current position in the employment structure.

In broad terms, talent management can be seen as the implementation of core management functions that focus on the operational aspects of an employee's life cycle in an organization. This includes activities such as recruitment and selection of high-potential candidates, adaptation processes, planning and supporting professional development, performance appraisal, compensation systems, shaping working conditions conducive to talent retention, as well as decisions regarding employee mobility and termination of employment in a managed and thoughtful manner. In the narrow approach, talent management boils down to the strategic selection and effective application of specialized instruments – whether of a legal, financial, social, organizational or technological nature. The aim of these activities is to create optimal conditions for attracting, developing and fully utilizing the potential of people considered key to the development and competitive advantage of the organization.

One of the relatively uncomplicated models used in talent management is the so-called DNA model. Its main premise is based on the idea that the fundamental element of an organization's "genetic structure" is the competencies of individuals, i.e. the abilities of employees. The model is universally applicable to human resource management in the broadest sense, covering all key stages of the employee cycle – from recruitment and onboarding, through position allocation, to career development and succession planning. The DNA model points to the need to strategically match individual employee skills to organizational needs, both at the current and future levels, making it possible to increase the efficiency of HR processes by precisely managing the demand and supply of competencies (Kravariti *et al.*, 2023).

Contemporary approaches to talent management increasingly consider the impact of dynamic technological changes, which are significantly transforming the functioning of knowledge-based organizations. Phenomena such as the development of artificial intelligence, process automation, and the widespread adoption of digital platforms supporting human resources management are gaining particular importance. Simultaneously, remote and hybrid work models are becoming a permanent element of organizational reality, shaping new challenges in identifying, motivating, and retaining talent. Ignoring these aspects leads to an incomplete picture of contemporary talent management conditions, especially in the context of knowledge organizations. Supplementing

the literature review with current technological and social trends is a significant step towards a deeper analysis and a better understanding of the dynamics of this process (Gupta *et al.*, 2024).

Research Findings

In the realities of global competition, companies are forced to attract and hire employees with above-average skills, but at the same time their ability to maintain control over human capital is being systematically eroded. This is particularly evident in the case of knowledge-based organizations, which, due to the nature of their business, are characterized by relatively little formal control over personnel (Li *et al.*, 2019). In addition, the external environment is fraught with numerous incentives that may induce talented employees to change their place of employment, which poses a serious challenge to staff stability. Therefore, it becomes necessary to implement comprehensive retention strategies aimed at long-term retention of high-potential employees. However, it should be noted that effective talent management can be significantly hampered by a number of barriers (Tafti *et al.*, 2017):

– bad employer brand;
– lack of trust;
– lack of commitment;
– threats of job loss;
– lack of characteristics of knowledge-based organizations.

Employer branding is one of the key tools for both attracting and retaining talented employees within an organization. Employer branding is sometimes defined as a holistic strategy aimed at attracting, hiring and long-term retention of high-potential and strategically competent individuals (Lievens & Slaughter, 2016). An effective employer brand must be characterized by uniqueness, which means that the organization needs to stand out from the competition by communicating values that are distinctive and relevant to it from the perspective of potential and current employees. In the context of human resource management, those personnel procedures that significantly affect the building of a strong and consistent employer brand deserve special attention. These include, but are not limited to: standards for conducting recruitment processes, professional development programs, compensation systems, initiatives that support work-life balance, diversity management mechanisms, talent management programs, and the way the organization conducts termination processes (Pabian, 2015).

Shaping a positive employer image is an important component of human resources management strategies, particularly in the context of attracting and retaining high-potential individuals. A company with a reputation as an attractive employer gains a competitive advantage in attracting talent, while

also influencing candidates' decisions to apply to the organization. What's more, positive employer branding has a motivational effect even after employment – it fosters identification with the workplace, encourages people to stay within the organization's structures, and stimulates activity aimed at promotion and obtaining outstanding professional results (Oczkowska, 2015). In contrast, a negatively perceived employer brand can lead to serious consequences. Even when employment conditions are satisfactory, the lack of prestige associated with belonging to a particular organization can generate dissatisfaction and discouragement. Companies with a poor employer reputation become unattractive to potential candidates, and current employees may manifest reduced levels of commitment, loyalty and efficiency, resulting in increased staff turnover in the long term (Hoppe, 2018). The foundation of knowledge-based organizations – often equated with smart organizations – is an extensive network of relationships based on trust. Its absence, both in the context of relationships with executives and colleagues, can be a consequence of ineffective trust management or the result of previous crises. In both cases, regaining trust can be a difficult and sometimes impossible process, significantly weakening organizational potential.

The turnover of highly skilled employees is one of the key barriers limiting the effectiveness of modern enterprises in Poland. A particular threat to the stability of human resources is the loss of high-potential people – so-called talents – whose departure can lead to serious losses in terms of knowledge, innovation and relational capital of the organization (Jurek, 2025). Among the most frequently cited reasons for talent resignation is the lack of adequate recognition from superiors. Failure to recognize an employee's competence, commitment and achievements not only lowers his or her job satisfaction, but also results in marginalization in the organizational structure – for example, by not assigning tasks that require high skills or responsibility. As a result, there is a sense of professional stagnation, underutilization of potential and loss of motivation, which promotes decisions to leave the organization (Gigol & Grabarska, 2024).

Effective talent management should be considered first and foremost as part of the management philosophy represented by the organization's top management. Without the idea being firmly rooted in the company's decision-making structures, it is difficult to expect long-term results in terms of talent development and retention. Strategic management, even if it is not the direct author of the formal talent management strategy, plays a key role in approving it, formulating the basic tenets of HR policies and ensuring their implementation. Its influence extends to the overall design of activities concerning employees with above--average potential. It is particularly important to involve the organization's leaders in key processes such as identifying, recruiting, developing, motivating, valuing and responding to talent departures. Lack of active participation of top management in these activities leads to a significant weakening of the stature

of talent management in the eyes of the rest of the organization, thus reducing its effectiveness and limiting the possibility of achieving competitive advantage through human capital (Pástor & Stambaugh, 2015).

Discussion

In the context of talent management, it is worth paying attention to improving the activities carried out by specialists, managers and HR employees. The most important recommendations are:

– building a strong employer brand: organizations should consistently and authentically communicate their values, organizational culture, and career development opportunities across digital channels, with a focus on social media, recruitment platforms, and professional networks (e.g., LinkedIn). These efforts should be measured by indicators of brand recognition and attractiveness among potential candidates (Reis *et al.*, 2021);

– strengthening trust and transparency in the organization: it is worth implementing regular feedback meetings, Q&A sessions with management, mechanisms for reporting problems (whistleblowing) and dialogue initiatives with employees, which support the development of a culture based on openness and mutual respect (Ortega-Rodríguez *et a*l., 2020);

– active management involvement: senior managers should be encouraged to participate directly in development initiatives (e.g., mentoring, talent review boards, personal development conversations with key employees) and to act as sponsors of strategic HR projects (Henk, 2024);

– adapting talent strategies to the realities of remote work and digital transformation: organizations should invest in digital talent management platforms (e.g., competency mapping tools, e-learning, artificial intelligence in recruitment) and adapt onboarding and development processes to the hybrid environment – taking into account diverse generational needs and work styles (Dolot, 2020);

– taking demographic trends into account in succession planning and talent development: due to the aging population and generational diversity in the workplace, it is recommended to develop policies for intergenerational knowledge transfer, reverse mentoring programs and an individual approach to employment flexibility (Mudrak, 2020).

Summary and Final Conclusions

At the beginning of the second decade of the 21st century, talent management ranked among the top priorities of human resource management leaders. Today, it is a rapidly growing and multidimensional field of organizational research, underpinned by strategic rationale and changing paradigms. Nonetheless, it remains a relatively young discipline, requiring in-depth theoretical and conceptual development before it can be fully recognized as an autonomous area of knowledge. There is still a need to improve methods of diagnosing and recognizing talent, as in many cases employees are not given the opportunity to demonstrate their potential in the tasks they perform. It is therefore important to design innovative solutions for attracting talent, in which practical activities in the economic environment play a significant role.

Translated by Author

References

Dolot, A. (2020). Wpływ pandemii COVID-19 na pracę zdalną – perspektywa pracownika. *E-mentor*, *83*(1), 35-43. https://doi.org/10.15219/em83.1456.

Gigol, T., & Grabarska, U. (2024). Wpływ zaangażowania w pracę na intencję odejścia z pracy w zależności od płci. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *68*(1), 26-37. https://doi.org/10.15611/pn.2024.1.03.

Goliński, M. (2018). Gospodarka cyfrowa, gospodarka informacyjna, gospodarka oparta na wiedzy – różne określenia tych samych zjawisk czy podobne pojęcia określające różne zjawiska. *Roczniki Kolegium Analiz Ekonomicznych*, *49*, 177-190.

Gupta, P., Mahajan, R., Badhera, U., & Kushwaha, P.S. (2024). Integrating Generative AI in Management Education: A Mixed-Methods Study Using Social Construction of Technology Theory. *The International Journal of Management Education*, *22*(3), 101017. https://doi.org/10.1016/j.ijme.2024.101017.

Hadad, S. (2017). Knowledge Economy: Characteristics and Dimensions. *Management dynamics in the Knowledge Economy*, *5*(2), 203-225. https://doi.org/10.25019/MDKE/5.2.03.

Henk, J. (2024). *Wpływ kierownictwa na poziom zadowolenia z pracy pracowników w przedsiębiorstwie handlowym*. Master's thesis. Kraków: Uniwersytet Jagielloński.

Hoppe, D. (2018). Linking Employer Branding and Internal Branding: Establishing Perceived Employer Brand Image as an Antecedent of Favourable Employee Brand Attitudes and Behaviours. *Journal of Product & Brand Management*, *27*(4), 452-467. https://doi.org/10.1108/JPBM-12-2016-1374.

Jurek, K. (2023). Zarządzanie kapitałem ludzkim w środowisku o wysokich kompetencjach – administracja publiczna. *Studia Administracji i Bezpieczeństwa*, *14*(14), 89-100. https://doi.org/10.5604/01.3001.0053.7822.

Jurek, K. (2023). Dialog i partycypacja obywatelska na poziomie lokalnym na przykładzie miasta Krakowa. *Zeszyty Naukowe Collegium Witelona*, *4*(49), 49-59. https://doi.org/10.5604/01.3001.0054.5169.

Jurek, K. (2025). Contemporary Use of Innovation in the Context of TSL Business Management. *Studia i Materiały Wydziału Zarządzania Uniwersytetu Warszawskiego*, *1*, 65-74. https://doi.org/10.7172/1733-9758.2025.42.6.

Kambur, E., & Yildirim, T. (2023). From Traditional to Smart Human Resources Management. *International Journal of Manpower*, *44*(3), 422-452. https://doi.org/10.1108/IJM-10-2021-0622.

Kott, J., Bujak, A., & Kott, M. (2018). Gospodarka 4.0 a elektroenergetyka. *Przedsiębiorczość i Zarządzanie*, *19*(11), 3, *Logistyka w naukach o zarządzaniu*, I, 43-54.

Kravariti, F., Tasoulis, K., Scullion, H., & Alali, M.K. (2023). Talent Management and Performance in the Public Sector: The Role of Organisational and Line Managerial Support for Development. *The International Journal of Human Resource Management*, *34*(9), 1782-1807. https://doi.org/10.1080/09585192.2022.2032265.

Lin, W.C., & Tsai, C.F. (2020). Missing Value Imputation: A Review and Analysis of the Literature (2006-2017). *Artificial Intelligence Review*, *53*(2), 1487-1509. https://doi.org/10.1007/s10462-019-09709-4.

Li, G., Wang, X., Su, S., & Su, Y. (2019). How Green Technological Innovation Ability Influences Enterprise Competitiveness. *Technology in Society*, *59*, 101136. https://doi.org/10.1016/j.techsoc.2019.04.012.

Lievens, F., & Slaughter, J.E. (2016). Employer Image and Employer Branding: What We Know and What we Need to Know. *Annual Review of Organizational Psychology and Organizational Behavior*, *3*(1), 407-440. https://doi.org/10.1146/annurev-orgpsych-041015-062501.

Mudrak, E. (2020). Starzejące się społeczeństwo jako jeden z problemów współczesnego świata. *Humanizacja Pracy*, *3-4*(301-302) 2020 (LII), 7-18.

Mikuła, B. (2018). Zarządzanie oparte na wiedzy–podstawowe założenia. *Studia Ekonomiczne. Gospodarka, Społeczeństwo, Środowisko*, *1*(2), 34-46.

Nambisan, S., Wright, M., & Feldman, M. (2019). The Digital Transformation of Innovation and Entrepreneurship: Progress, Challenges and Key Themes. *Research Policy*, *48*(8), 103773. https://doi.org/10.1016/j.respol.2019.03.018.

Oczkowska, R. (2015). Kreowanie wizerunku organizacji jako pracodawcy. *Edukacja Ekonomistów i Menedżerów*, *38*(4), 185-197.

Ortega-Rodríguez, C., Licerán-Gutiérrez, A., & Moreno-Albarracín, A.L. (2020). Transparency as a Key Element in Accountability in Non-Profit Organizations: A Systematic Literature Review. *Sustainability*, *12*(14), 5834. https://doi.org/10.3390/su12145834.

Pabian, A. (2015). Zrównoważone zarządzanie zasobami ludzkimi – zarys problematyki. *Zeszyty Naukowe Politechniki Częstochowskiej. Zarządzanie*, *17*, 7-16.

Pástor, Ľ., Stambaugh, R.F., & Taylor, L.A. (2015). Scale and Skill in Active Management. *Journal of Financial Economics*, *116*(1), 23-45. https://doi.org/10.1016/j.jfineco.2014.11.008.

Powichrowska, B. (2018). Od zarządzania wiedzą do zarządzania w kolorze turkusu. *Przedsiębiorstwo & Finanse*, *1*, 95-104.

Reis, I., Sousa, M.J., & Dionísio, A. (2021). Employer Branding as a Talent Management Tool: A Systematic Literature Revision. *Sustainability*, *13*(19), 10698. https://doi.org/10.3390/su131910698.

Steinerowska-Streb, I. (2017). Zarządzanie wiedzą w przedsiębiorstwach rodzinnych. *Studia Ekonomiczne Regionu Łódzkiego*, *26*, 10-14.

Tafti, M.M., Mahmoudsalehi, M., & Amiri, M. (2017). Critical Success Factors, Challenges and Obstacles in Talent Management. *Industrial and Commercial Training*, *49*(1), 15-21. https://doi.org/10.1108/ICT-05-2016-0036.

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ORIGINAL PAPER

FROM SUSTAINABILITY TO A REGENERATIVE ECONOMY – PLANET-CENTRIC TRANSFORMATION IN THE FACE OF CONTEMPORARY CHALLENGES

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JEL Classification: Q2, Q56, Q57.

Key words: regenerative economy, planet-centric paradigm, sustainable development, green transformation, postgrowth.

Abstract

The text is devoted to the idea of regenerative development, which is a response to the challenges of the climate crisis, depletion of natural resources and social inequalities, going beyond the traditional approach of sustainable development. Regenerativity is treated as a premise for active repair and reconstruction of natural and social systems, for their further evolution and strengthening. The changes of the goals of the green transformation are presented, from the ecological economy, through sustainable, to regenerative, the aim of which is to improve the well-being of the environment and meet social needs. The analysis takes into account axiological, economic and social aspects, emphasising the importance of the planetocentric approach and the role of interdisciplinarity in designing innovative solutions, especially in cities.

The text stresses that the planetocentric axiology of the transformation requires a departure from traditional economic growth in favor of harmony with ecosystems, focusing on the quality of life, social equality and ecological health. Concepts such as degrowth, zero-growth or the donut economy indicate the need for a profound change in values and development goals, integrating the aforementioned environmental, social and economic goals. Regenerative urban ecosystems and a transdisciplinary approach are key to effective transformation.

The idea of regenerative development has a tradition of over a hundred years. Initially, it was associated with the development of urban and rural spaces, and today it is understood as active support for biodiversity and the complexity of living systems. Regenerative design replaces anthropocentrism with a biocentric model, striving for synergy between different areas of human activity to preserve the planet's evolutionary capabilities. By exploring the axiological, practical, and theoretical foundations of this shift, the article aims to provide a basis for further reflection and action towards a more sustainable and regenerative future. The text is a voice in the discussion on the need to change management paradigms to planet-centric ones, preventing crises and serving a more just future.

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OD ZRÓWNOWAŻONEGO ROZWOJU DO REGENERACYJNEJ GOSPODARKI – PLANETOCENTRYCZNA TRANSFORMACJA W OBLICZU WSPÓŁCZESNYCH WYZWAŃ

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Słowa kluczowe: ekonomia regeneracyjna, paradygmat planetocentryczny, zrównoważony rozwój, zielona transformacja, postwzrost.

Abstrakt

Tekst poświęcono idei regeneratywnego rozwoju, stanowiącej odpowiedź na wyzwania kryzysu klimatycznego, wyczerpywania zasobów naturalnych i nierówności społecznych, wykraczającej poza tradycyjne podejście zrównoważonego rozwoju. Regeneratywność jest traktowana jako przesłanka aktywnego naprawiania i odbudowy systemów przyrodniczych i społecznych na rzecz ich dalszej ewolucji i wzmacniania. Przedstawiono przeobrażenia celów zielonej transformacji, od gospodarki ekologicznej przez zrównoważoną, aż po regeneracyjną, której celem jest poprawa dobrostanu środowiska i zaspokojenie potrzeb społecznych. Analiza uwzględnia aspekty aksjologiczne, ekonomiczne i społeczne, z podkreśleniem znaczenia podejścia planetocentrycznego oraz roli interdyscyplinarności w projektowaniu innowacyjnych rozwiązań, zwłaszcza w miastach.

W tekście podkreślono, że planetocentryczna aksjologia transformacji wymaga odejścia od tradycyjnego wzrostu gospodarczego na rzecz harmonii z ekosystemami, z podkreśleniem jakości życia, równości społecznej i zdrowia ekologicznego. Takie koncepcje, jak dewzrost, zero growth czy ekonomia obwarzanka, wskazują na potrzebę głębokiej zmiany wartości i celów rozwojowych, łączą wspomniane cele środowiskowe, społeczne i gospodarcze. Regeneratywne ekosystemy miejskie oraz transdyscyplinarne podejście są kluczowe w skutecznej transformacji.

Idea regeneratywnego rozwoju ma ponad stuletnią tradycję. Początkowo była ona związana z rozwojem przestrzeni zurbanizowanych i wiejskich, a dziś jest rozumiana jako aktywne wspieranie różnorodności biologicznej i złożoności systemów ożywionych. Regeneratywne projektowanie zastępuje antropocentryzm modelem biocentrycznym, dąży do synergii między różnymi obszarami działalności człowieka w celu zachowania zdolności ewolucyjnych planety. Autor artykułu, analizując aksjologiczne, praktyczne i teoretyczne podstawy tej zmiany, ma na celu stworzenie podstaw do dalszej refleksji i działań na rzecz bardziej zrównoważonej i regeneracyjnej przyszłości. Tekst stanowi głos w dyskusji nad koniecznością zmiany paradygmatów gospodarowania na planetocentryczne, zapobiegające kryzysom i służące bardziej sprawiedliwej przyszłości.

Introduction

In the face of escalating challenges posed by the climate crisis, the depletion of natural resources, and increasing manifestations of social inequality, it has become imperative to seek new models of development and change management that extend beyond the traditional confines of sustainable development. The idea of regenerative development represents a response to the direction and nature of these transformations, encompassing key sectors of the economy, patterns and

modes of designing, consumption, models of resource management, and processes of resource utilisation (Reed, 2007, p. 675; Edwards, 2010, p. 91; du Plesis, 2012, p. 15; Mang & Reed, 2017). Regenerativity, as a concept, embodies an abstract value that highlights the restorative, renewing, or reconstructive purpose of undertaken actions aimed at addressing depleted resources. The broadly intended outcome is the restoration of balance within economic ecosystems, aligned with the demands of these global challenges. In contrast to strategies that primarily aim to minimise environmental damage, the regenerative approach focuses on proactive efforts to drive economic transformation and to rebuild natural and social systems, thereby enabling their further evolution and strengthening (Lyle, 1994, p. 10; Reed, 2007, p. 676; Wahl, 2016).

This text presents the evolution of the green transformation concept, illustrating the transition from an ecological economy, through a sustainable one, to a regenerative model. The regenerative economy seeks not only to preserve but also to enhance the well-being of the natural environment, restore its regenerative capacity, and meet essential social needs (Čegar *et al*., 2024, p. 7; Khan *et al*., 2025, p. 10; Sánchez-Canón *et al*., 2025, p. 12). The analysis covers selected axiological, economic, and social aspects of these changes, which determine the effectiveness of the transformational strategies being designed and implemented. Special attention is given to the concepts of regenerative urban ecosystems and the use of inter- and transdisciplinary approaches in the design of innovative solutions in areas such as urban planning, management, production, consumption, and social services.

This introduction to the notion of regenerativity invites reflection on a shift in economic paradigms – one that prioritises planet-centricity within the hierarchy of civilisational values. Regenerative development requires a switch in paradigm: from the old linear way of metabolism to a new one – circular. Regenerative development of urban and rural areas seeks to mimic the natural systems (Lyle, 1994, p. 10). By exploring the axiological, practical, and theoretical foundations of this shift, the article aims to provide a basis for further reflection and action towards a more sustainable and regenerative future. The text is a voice in the discussion on the need to change management paradigms to planet-centric ones, preventing crises and serving a more just future.

Understanding this concept and applying it in practice may contribute to the creation of systems that not only respond to crises but also prevent them, thereby laying the groundwork for a more equitable and sustainable future. The research question posed is: What directions and methods for implementing transformation result from shifts in key values and development priorities? How effective can a paradigm shift be in the context of comprehensive urban and rural development?

Literature Review

The literature review was conducted in two directions. The first serves to present a descriptive and theoretical understanding of the concept of regenerativeness. It constitutes a development goal and determines the methods for its implementation within the context of emerging development strategies (Del Borghi *et al*., 2024). Regenerative development is understood as encompassing means and methods of action that create a holistic framework for understanding place and developing strategic systems thinking capabilities. This requires the engagement of stakeholders who ensure maximum impact and systemic support for regenerative processes. The goal is a sustainable state of equilibrium, which refers to the health, adaptive capacity, and evolutionary potential of the global social-ecological system so that it can regenerate itself (Mang & Reed, 2012, p. 2; Gibbons *et al*., 2018, p. 5).

It is significant that the idea of regenerativeness, despite repeated demands for a holistic understanding, is usually approached from the perspective of separate disciplines and, as a result, is fragmented and contextualised. Regenerativeness then serves as a conceptual hallmark of selected theories in economics, management, demography, sociology, urban planning, architecture, ecology, and philosophy (Newman *et al*., 2009; D'Alisa *et al*., 2014; Gibbons *et al*., 2018; Fayed *et al*., 2018; Attia, 2018; Nowacki & Foissac, 2022; Vince, 2022). Research approaches oscillate between anthropocentric, biocentric, and planetocentric approaches (Daly, 2005; Raworth, 2021). Urban studies associate regenerativeness with urban solutions that are friendly to people and the natural environment and serve as an alternative to modernism and functionalism (Farr, 2008; Gehl, 2017; Mehaffy & Salingaros, 2017; Rose, 2019; Sim, 2020). In turn, forsight studies understand regenerativeness as a way of conceptualising and managing future change. It defines development goals, sources, and conditions, shapes the view of reality and time, indicates methods of implementation and measurement, and focuses on processes (Camrass, 2020; 2023, p. 91). In the philosophical and ethical dimensions, regenerativeness is a value and obligation treated as a postulated and broadly justified goal of the necessary economic, social, and political transformation (Bińczyk, 2018; Green, 2021; Egmose *et al*., 2021; Bińczyk, 2024). In the face of the fundamental nature of change, accompanied by a diversity of approaches and fragmentation of issues and ways of understanding, regenerativity requires a systematic and synthetic approach as an important determinant and pattern of development.

The second direction refers to the practical significance of the concept of regenerativeness, thus having application and evaluative significance. The proto-regenerative nature of solutions and their measurable regenerative effect can serve as a measure of solutions and an evaluation tool. It can refer to existing sustainable natural and human-created systems, both currently and in the future (Ayadi & Sessa, 2023, p. 14). Given the scale of urbanisation

processes, regenerativeness depends primarily on the transformation of urban metabolism. This will mainly determine the possibilities and success of the necessary change in environmental, climatic, economic, social, technological, and political aspects (Cole *et al.*, 2013, p. 241; Woo *et al.*, 2014; Rose, 2019, p. 45; *Urban Regeneration as a Tool for Inclusive and Sustainable Recovery*, 2022). Regenerativeness is a measure that allows for the assessment of the consequences of planned and implemented actions in the development of cities, districts, or even individual objects (Conte & Monno, 2016, p. 13; Attia, 2018; Dumitrescu *et al.*, 2021, p. 14). It is also becoming a distinguishing feature of a design orientation focused on pursuing effective organisational solutions and strategies (Godelnik, 2021), technological (*RENEW. A manifesto for regenerative design and engineering*, 2025), and social (Gibbons, 2020a; Buckton *et al.*, 2023). An attempt at a comprehensive systematisation of theoretical approaches and their practical verification was undertaken by Gibbons (2020a, p. 23). Their systematic study seems necessary, as it allows for the capture of the dynamics of transformation and the assessment of the level of acceptance and use of the planetocentric paradigm.

The aim of the literature selection was to show the complexity of transformation problems and to capture the evolution in the ways of understanding them. They are visible both in the proposed review and in the deepening conviction about the need to create comprehensive solutions, which the authors of individual works are trying to achieve. In this case, it is important to link the goals, tasks and transformation activities with a coherent set of values justifying the need for regenerative change. Due to the number and variety of approaches, the literature devoted to the issue of green transformation is a separate research problem (Khan *et al.*, 2025; Čegar *et al.*, 2024).

Methodology

This article provides a theoretical analysis of the discourse surrounding paradigm shifts currently under discussion in economics, management sciences, and philosophy. The content analysis focuses on the assumptions and conclusions of regenerative economics and the degrowth concepts (Hickel, 2021; Raworth, 2021; Regenerative Economics, 2025).

Two issues require clarification. First, the concept of a paradigm encompasses scientific views and beliefs recognised and applied by researchers in specific historical, social, and civilisational realities. A paradigm explains the state of consensus within individual scientific disciplines, which guarantees coherence of research practices, interpretation of phenomena and processes, and the possibility of verifying acquired knowledge. A prevailing paradigm is therefore a metatheoretical arrangement that allows for coherence, understanding the key

premises, and content of accepted knowledge, important for individual scientific disciplines (Kuhn, 2001, p. 314). Among the proponents of a single paradigm, there is agreement regarding the fundamental assumptions used in research and defining the boundaries of so-called "normal science" that is, research practices accepted and recognised in a given place, time, and discipline.

Secondly, the concept of a paradigm can be referred to the process of shaping a cognitive consensus that accompanies research practices. This second meaning refers to situations leading to a change in fundamental assumptions and cognitive beliefs that determine accepted theories. The values and goals accepted by researchers in specific disciplines influence the practical outcomes of existing scientific theories, the limits of their application, and the results achieved (Kuhn, 2001, p. 320). The process of paradigm shift indicates the social, historical, and cultural context of scientific development. The factors determining alternative paradigms result from both the heuristic development of science (new facts and theories) and new needs and challenges. In the long term, they lead to a new consensus that determines the validity of scientific knowledge.

Kuhn's philosophical findings on the theory of science have explanatory potential for the approach currently used in economics. This paradigm shift points to the need to incorporate factors of change that have not previously been fundamental in theoretical and practical research. These include large-scale climate change, environmental change, and constraints on the availability and use of resources.

Paradigm transformation is a multi-level phenomenon. It is co-constituted by abstract values, goals, and principles explained philosophically. It is shaped through scientific, theoretical elucidations of environmental, climatic, economic, and social processes and phenomena. The third component comprises practical, designed, and implemented solutions that serve the realisation of the aforementioned objectives. Philosophical reflection on transformation takes the form of a hermeneutic interpretation of change, wherein parts determine the understanding of the whole, and a coherent understanding of the whole, in turn, defines the possibilities for comprehending the parts (Gibbons *et al.*, 2018; du Plessis, 2022).

The first part of the discussion is dedicated to changes in the understanding of the scale and scope of economic transformation. It was conducted in the form of a comparative analysis, aimed at demonstrating key turning points in the development of awareness regarding increasing developmental constraints. The subsequent section addresses the concept of planetocentric axiology. This part was undertaken as a retrospective analysis of selected concepts and an examination of related ideas. The objective is to highlight the interdisciplinarity of the approach and the need for a holistic interpretation of the transformation processes oriented towards the creation of urban ecosystems that utilise solutions from circular and regenerative economies, as well as social and technological innovations focused on inclusivity and resilience.

Evolution in the Understanding of the Transformation Concept

Initially, transformation at the level of action was primarily associated with selective efforts to reduce environmental damage, aimed at minimising the negative impact of the economy on the natural environment. Over time, economic activities began to align with the idea of sustainable development (du Plessis, 2012, p. 8). However, in both cases, these actions were not regarded as constituting a global systemic change (Rogall, 2010, p. 39). Signals emerging from theoretical research on the goals and scope of transformation were notably broader, with roots tracing back to the 1970s and 1980s (Meadows *et al.*, 1972; *Report of the World Commission…*, 1987).

By the mid-1990s, visionary proposals had emerged advocating for a fundamental transformation and the creation of a new approach centered around green design, reduced production, and the promotion of sharing practices and shared access to goods and services (Rifkin, 2003, p. 122). These propositions stemmed from an awareness of the limits to growth, global inequalities and paradoxes, and increasing economic stratification in an increasingly globalised world (Papanek, 2021, p. 14, 202, 256). Over time, this initial orientation was replaced by a model of development aimed at a sustainable economy (Senge *et al.*, 2008, p. 103).

A turning point in achieving a transformational consensus came with the United Nations' adoption of the global 2030 Agenda for Sustainable Development (*Transforming Our World…*, 2015). This marked not only a limited political agreement on the international stage but also a means of institutionalising and globalising the issue of negative changes in the climate, environment, society, and economy at that stage of civilisational development. Observing a decade of the Agenda's implementation reveals numerous indications of insufficient progress (*The Sustainable Development…*, 2023, p. 8; Lee & Romero (Eds.), 2023, p. 25). The monitoring of its outcomes and growing pressures from ongoing climate change, alongside increasing knowledge of their determinants, provided the impetus for the development of a restorative, and subsequently regenerative, economy. Both concepts now reflect new goals, narratives, and, in practice, innovative projects and forms of cooperation (Morseletto, 2020, p. 764).

These approaches emerged from the transformation of three successive models: from sustainable, to restorative, to regenerative (Brown *et al.* (Eds.), 2018, p. 91). The hallmark of the first was the reduction of negative impact and the pursuit of a balance point where the level of environmental resource use is offset by what is recovered and reused in production and consumption. The second focused on healing social and ecological systems. The third seeks to enable these systems to maintain their health and to continue evolving (Brown *et al.* (Eds.), 2018, p. 16).

The evolution of the green transformation idea – from a sustainable to a regenerative economic model – permanently integrates environmental, social, and strictly economic dimensions (du Plesiss, 2022, p. 3). It facilitates the creation of new quality in resource management, spatial planning, and human collaboration. It also underscores the importance of transdisciplinarity, regenerative urban ecosystems, and planet-centricity as key determinants of future transformational efforts. By exploring the axiological, practical, and theoretical foundations of this shift, the article aims to provide a basis for further reflection and action towards a more sustainable and regenerative future (Camrass, 2023, p. 95).

Planetocentric Axiology of Transformation

Signals indicating the need for a profound, systemic shift in approaches to economic activity and resource management have emerged repeatedly over the past half-century (Cunningham, 2002, p. 17). The logic behind this change can be explained by a growing awareness of the exhaustion of the rational and utilitarian foundations of the existing economic order and its theoretical justification. This has resulted in heightened expectations driven by the consequences of problematic manifestations of growth – growth that lacks economic and social justification and unfolds under conditions of environmental and climate crisis (Daly, 2005, p. 101; Hickel, 2021, p. 48; Raworth, 2021, p. 73; du Plessis, 2022, p. 3).

The new approach calls for a broader understanding of the effectiveness of economic activity – one that incorporates environmental and climate imperatives. It is characterised by holism, an ecosystemic orientation, and a focus on achieving regenerative outcomes. These actions are evaluated not solely from an economic standpoint but also from environmental and social perspectives, moving beyond human-centered economic expectations and narrowly defined utility.

Following more than two decades of evolution, the green transformation reflects a growing awareness of the necessity for systemic coordination of objectives and the monitoring of changes aimed at counteracting climate change (Mariussen *et al.*, 2021, p. 21). This means that, among various activities, environmental and climate goals are increasingly prioritised over strictly economic ones. Analysing the current system, Raworth (2021, p. 31) emphasised the need for a deep, comprehensive transformation that integrates environmental, social, and economic objectives. In her "doughnut economics" framework, she advocated for an agnostic approach to the idea of long-term GDP growth as a defining economic and political metric in the modern world (Raworth, 2021, p. 35, 114). Rejecting the mythologised cult of growth, Raworth stressed intergenerational

responsibility and the resulting axiom that the needs of the present must be met without compromising those of future generations. The economy should operate in harmony with ecosystems, without the imperative of maximising production and consumption (Raworth, 2021, p. 233). Economic success might instead be understood in terms of quality of life, social equity, or ecological health. Climate change and pandemics further justify an agnostic view of growth.

However one defines the alternative development path – be it post-growth, zero-growth, degrowth, or a growth – it is first and foremost a transformation in the realm of values, transcending the limits of strictly economic thinking (Skrzypczyński, 2020, p. 9). The intended outcomes of this transformation are regenerative for the natural environment and compensatory for society. This means that the economy should undergo a metamorphosis primarily oriented towards non-economic, planetary goals, taking place simultaneously across many areas of human activity in the direction of degrowth, and most significantly, on a scale that has not previously been attempted (D'Alisa *et al*. (Eds.), 2020, p. 50).

Among the calls for systemic change is the proposal to permanently integrate planetarily understood environmental objectives with changes at the level of the economy (Geordan *et al*., 2022, p. 84, 87). This highlights the necessity of pursuing actions that go far beyond the conventional sustainable, anthropocentric model of development (Hickel, 2021, p. 238).

Planetocentricity is understood as an approach to developmental goals and as a model of hierarchy for cultural, economic, social, and civilisational values. It implies a postulate of degrowth – consumption that is conscious, responsible, shared, and limited, or replaced in the future by alternative forms such as the fulfilment of essential needs, access to goods and services, and sharing in the spirit of a presumption economy (Bińczyk, 2018; Hickel, 2021; Dujarier, 2016).

Planetocentricity, as an approach, is not merely an alternative to the previous model. Firstly, it requires interdisciplinary analysis and an understanding of change, which means the simultaneous planning and implementation of actions across several distinct yet interrelated perspectives. Secondly, transformation involves engaging with entirely new problem areas where no ready-made or proven solutions, tools, or interpretations of change exist. At the intersection of these areas lie values and objectives that are essential for determining the significance of planned and undertaken actions (*The Post Growth Encyclopedia*, 2024). They require transdisciplinarity as an orientation in both research and solution development – an approach in which, faced with new challenges and problems, it becomes essential to cognitively and creatively (e.g., through design) connect numerous distinct disciplines, along with their respective methods and tools. Transdisciplinarity is also an inherent attribute of the values being developed and the ways in which these values are applied, particularly in contexts where complex phenomena and processes are assessed and where their impacts are simultaneously relevant across multiple domains of change: environmental, social, economic, and technological.

The values created and utilised in this context are simultaneously relative and regulative, employed in a transdisciplinary manner, and their significance is contingent upon the context in which they emerge (Pascual *et al*., 2023, p. 815). In each case, these are instrumental values – that is, they primarily serve as tools to convey the meaning and outcomes of undertaken actions, rather than being ends or objectives in themselves.

The idea of regenerative development, initially understood within the context of design, is not new; it has a history spanning over a century (Howard, 2015, p. 33; Geddes, 1915). Originally conceived under vastly different environmental, social, and economic conditions, it referred to a proposed model for the development of both urban and rural spaces. It aimed at integrally combining economic development with the potential of natural environmental resources. Over time, its defining feature became the concept of building functional ecosystems. These ecosystems were to facilitate the use of existing conditions and to bring together stakeholders in the transformation process. Within this concept, not only the creation of favorable conditions and the development of cooperation were vital, but also achieving synergy.

Nearly 90 years ago, Tansley (1935) used the term "ecosystem" to describe the interactive relationships of living organisms within their inanimate environment. He assumed that ecosystems allow for a better understanding of the complexity of mutual interactions and the role of humans within them. Today, the ecosystem approach has gained prominence, particularly in the context of research on urban systems (Pickett *et al*., 2009), as well as in the development of regenerative pathways for rural areas, food production and distribution, education, management, and comprehensive interdisciplinary concepts for implementing regenerativity (Buckton *et al*., 2023, p. 824).

Today, regenerative development – alongside associated regenerative design and innovations for regenerativity – is understood as an approach that surpasses the idea of sustainable development. It does so by actively creating the conditions necessary for and supporting the development of complex living systems, biodiversity, and species-level anti-expansiveness. Over the final three decades of the twentieth century, several design practices emerged in response to natural environmental conditions (notably by I. McHarg, B. Mollisson, D. Holmgren, R. Rodale, D. Orr, F. Capra, among others). Regenerative solution design and change management replace the anthropocentric model with a complex biocentric framework, leading to the creation of regenerative ecosystems (Mang & Reed, 2020, p. 14). These ecosystems are understood both as a prerequisite and a goal of development.

They focus on "enhancing the capacity of living beings to co-evolve so that the planet possesses potential in terms of diversity, complexity, and creativity". In practical terms, this broad formulation requires harmonising disparate areas of human activity to ensure the continuity of life processes at the planetary scale – especially at a time when biodiversity indicators are declining rapidly.

According to the regenerative approach, actions taken by humans should be oriented towards positive environmental outcomes, which, through synergy, ultimately generate other beneficial results as well (Mang & Reed, 2020, p. 2). According to Gibbons, "regenerative sustainability, the next wave of sustainability, is based on a holistic worldview and aims for thriving whole living systems. It integrates inner and outer realms of sustainability and focuses on shifting deep leverage points in systems for transformational change across scales" (Gibbons, 2020b, p. 4).

Ultimately, regenerative design concepts act as catalysts for the development of social activism and innovation, aiming to implement pro-environmental initiatives at the local level (Gibbons, 2020a, p. 32). An example of this is the Regenesis Group initiative, which promotes the design and implementation of regenerative solutions locally and in a planetocentric manner. This approach and its scale appear unprecedented and are not easily understood through analogies with various historical practices. Thus, the values and principles shaped under past conditions are no longer suitable for adequately assessing current and future challenges (Mang & Reed, 2020, p. XIX).

For this reason, new approaches are being sought and applied in accordance with local conditions and a dynamic understanding of regenerativity. Among the transformation-oriented practices are also those that use speculative design as predictive, exploratory tools, producing future scenarios focused on selected aspects of the co-existence of humans and non-human species in urban environments (Edwards & Nilstad Pettersen, 2023, p. 4). This is particularly relevant as we face the third century of urbanisation, making the challenge of regeneratively developing cities on a global scale one of the most decisive tasks of the green transition (Barber, 2014).

In conceptual terms, regenerative urban ecosystems should be oriented towards (Rose, 2019; Sim, 2020, p. 181):

– dynamic, balanced coherence in the organisation and use of urbanised space;

– a circularly organised metabolism in the management of available resources, particularly water;

– resilience derived from green, regenerative infrastructure, with expanding urban green spaces serving as habitats for numerous animal species;

– community-oriented development, understood as fostering opportunities through building social networks, trust, locality, synergy creation, the dissemination of activism, shared values, and a sense of agency;

– empathy as a universal approach to recognising and understanding the needs of other beings – opening spaces and relationships to diverse needs and integration, striving for wholeness and participatory governance.

Among various conceptual frameworks, several key values of future urbanism are consistently emphasised. These relate to a prudent and efficient approach to managing available resources so that the city can be both ecologically and

economically sustainable, while accommodating the needs of both human and non-human life. In the regenerative urban model, the principle of full circularity is adopted with regard to water, energy, food, raw materials, and waste.

A socially significant value of future urbanism is accessibility, understood as the development of solutions that embrace diversity, inclusiveness, and equality – regardless of age, individual capabilities, religious beliefs, wealth, origin, sexual orientation, gender identity, or political views. The aim is to ensure equal and fair access to urban amenities, employment, business opportunities, social services, education, culture, heritage, sports and recreation, and natural resources.

The pursuit of inclusivity has a practical dimension – it is linked to access to affordable housing and home ownership. This process should be participatory, accompanied by transparent governance and support for the development of local communities. Sharing is a core value of future cities, reflecting a sense of community, collaboration, and co-action. It enhances spaces designed for social interaction through shared facilities, public spaces, coworking and co-living environments, and public transport. It also encompasses intangible values such as sharing skills, access to mobile technologies, and initiatives aimed at strengthening social connections.

Security is a value of the future city, derived from resilience – defined as the capacity to withstand climate change, extreme weather events, and flooding. Enhancing the sense of safety for all is also linked to crime prevention and efforts toward reintegration. The objective is to ensure a clean and healthy environment and access to essential resources (food, water), shelter, care, and to promote the physical and mental well-being of residents through access to healthcare and green spaces.

The city of the future is one desired by its inhabitants, scaled to human dimensions (Gehl, 2017, p. 29). It is the ”15-minute city” (Moreno *et al.*, 2021, p. 96), one that encourages activity, sparks curiosity and wonder, and inspires exploration – buzzing with life in public space and offering access to cultural goods, the arts, physical activity, relaxation, and learning opportunities (*The Ideal City…*, 2021, p. 9). Examples of coherent, conceptual approaches to this complex shift include the transformation strategies of Copenhagen (*Urban Green Transition…*, 2023), Amsterdam (*New Amsterdam Climate*, 2021), Paris (*Paris Resilience Strategy*, 2018), and other cities.

Practices over the past several years have demonstrated that cities are not only a possible but also a desirable and effective arena for green transformation, with agency residing with both their administrators and residents in legal, social, economic, and political terms. According to Barber, the rationale for this lies in the privatised, hegemonic, and monopolised character of globalisation. The value of inter-city cooperation serves as an alternative to the inefficacies of national-level politics and the operations of global, transnational corporations. “Cities, embedded in the fabric of an informal cosmopolis, may become, as the

polis once was, new incubators of democracy – this time on a global scale" (Barber, 2014, p. 28).

In foresight analyses, the role of future cities is to develop as complex local organisms and communities – centers of green, grassroots democracy oriented toward planetary goals and ecosystem-based solutions (Schuring & Turan, 2021, p. 166). Among many contemporary urban concepts, it is perhaps not surprising that favelas are increasingly viewed as anticipatory models for the desired future path of urban development. This is because the solutions commonly found in such environments most closely reflect the idea of a sustainable city – one that operates under conditions of scarcity and respects resource limits. Their defining features include short distances, human scale, high density of buildings and population, widespread use of small-scale water retention systems, low energy needs, use of recycled materials, diversity, low living costs, direct interpersonal relations, a tangible sense of community, and local forms of governance (Hosey, 2021, p. 158).

As living ecosystems, favelas embody what may become the goal of a desired, minimalist urbanisation in the future. Numerous developmental parallels can also be seen in the transformations of cities in India and Peru, as well as in the enclaves and unique solutions being created there (Szczęsny, 2023). This interpretation of urban development is gaining significance in light of the challenges facing the cities of tomorrow – challenges related to expansion, densification, multiculturalism, mobility, and resilience (Sim, 2020, p. 244).

Discussion

Transformational change involves more than just a temporary shift in social and economic terms. To better elucidate this, it is useful to refer to T. Kuhn's concept of paradigm shifts in the foundations of science. According to Kuhn's central theses, science is simultaneously a cultural, cognitive, and social phenomenon. The values, theories, cognitive patterns, and operational rules that prevail within it arise from dominant behaviors, social needs, and the epistemic consensus reached among researchers (Kuhn, 2001, p. 33, 63).

The historical development of knowledge is not a cumulative expansion of existing understanding but a replacement of previous theories with new ones – those better suited to emerging needs and challenges. As cognitive shifts occur, social changes follow: new research groups emerge, along with new supporters of their theories and new stakeholders. The essence of this process can be explained through the necessity of adapting to change and the urgent search for tools that respond to new challenges, living conditions, and societal needs.

Kuhn's universally relevant perspective lends itself to understanding current transformational challenges (Kuhn, 2001, p. 167). Such analogies are particularly apt, for example, in contexts where transformation occurs from a linear

to a circular, and then to a regenerative economic model. J. Fullerton explained the core of this change as a shift from one era to another – an evolution that is inevitably accompanied by chaos and the gradual emergence of an alternative system. He sought the foundations of this system in the universal order of the natural world: "Universal patterns and principles that the cosmos uses to build stable, healthy, and sustainable systems throughout the real world can and must be used as a model for designing economic systems" (Fullerton, 2015, p. 8).

Here, we may set aside the range of ontological assumptions regarding the existence of cosmic order and equilibrium as a blueprint for an economic system. More important are the arguments for the need for a holistic understanding of the necessary economic changes. Fullerton's assumptions are primarily rooted in analogical thinking. In explaining the regenerative capitalism model, he draws on the concept of organicism, emphasising the role of multi-level interdependencies and outlining the key requirements for a future system.

The development of such a system is guided by the following general principles:

– abandoning the anthropocentric paradigm and rejecting the notion of human opposition to the biosphere. Fullerton advocates replacing the current approach with the recognition of the universality of connections and mutual interactions between humans and nature;

– a holistic understanding of wealth, seen as well-being across economic, social, cultural, and existential dimensions, where the real value is defined by the weakest link in the web of interdependencies;

– conditioning change on the use of innovation, the degree of adaptability achieved, and other measurable outcomes;

– enhancing social participation as a means of engagement, relationship-building, and fostering awareness of the part–whole dynamic, while simultaneously enabling contribution and creating space for individual needs;

– recognising community and place as correlates of collective values – encompassing history, beliefs, and attachment to place – as factors that build healthy, unique communities;

– striving to achieve abundance at the system's margins, where differing components meet, and conditions exist that foster creativity and synergy. This generates abundance, cooperation across differences, cross-boundary collaboration, innovation, shared benefits, and a growing disposition towards change;

– maintaining a robust circulatory system – i.e., the flow of financial resources, exchange of information, and constant, repeated use of materials – to ensure the functioning of a healthy economic organism;

– pursuing a state of balance, not as a static equilibrium, but as a harmonisation of multiple parts, replacing the goal of optimising individual components.

Fullerton (2015, p. 8) concludes, "Regenerative Economics seeks balance: between efficiency and resilience, cooperation and competition; diversity and coherence, as well as between small, medium, and large organizations and needs". According to him, the necessary changes involve replacing liberal capitalism

with solutions derived from the aforementioned principles. The transformation must be fundamental, given the critical juncture at which humanity currently finds itself. The aim of his concept is to outline the conditions for long-term prosperity, and the actions he advocates are intended to ensure and maximise the enduring health of society and the planet. Thus, they are not mere reactive measures against the negative consequences of change. Where necessary, Fullerton allows for systemic intervention to balance the interaction of antagonistic factors. He views the resolution of social, economic, and environmental crises as a means of enhancing profitability and economic well-being (Fullerton, 2015, p. 106).

The concept of regenerative capitalism can be regarded as a set of ideas situated within the philosophy of economics – an abstract vision of economic development that outlines the framework, objectives, and core values that give meaning to the entire system. On the one hand, as a project, it constitutes a constructive response to the visible symptoms of crisis (environmental, climate-related, and social); on the other hand, it can be interpreted as one of the alternative narratives to neoliberal capitalism. Significantly, Fullerton associates regenerativity with a capitalist system. While he recognises the most important systemic causes of economic pathologies, his thinking remains largely reformist. He sees his view as an alternative to both liberal and conservative approaches, necessary in the face of 21st-century challenges and as a framework for discussions about future development.

His proposal is compelling enough to have found further development in the theory of Green Swans – an optimistic vision of deeply reformed economic, social, and environmental development (Elkington, 2021, p. 152). However, it does not represent a radical departure akin to the thinking of Raworth, Hickel, or Kallis, who argue for a profound systemic overhaul, requiring an alternative such as degrowth (or post-growth) as the defining metric of a new economic, social, and political order.

Summary and Conclusions

This article has outlined the transformative evolution of the idea of sustainable development towards a regenerative model, which responds to the contemporary environmental, social, and economic challenges. The green transformation, historically understood as a process of gradually reducing the negative human impact on the environment, is giving way to an approach that not only repairs damage but also actively restores ecosystems and supports their evolution. A central element of this shift is the planetocentric axiology, which redefines development priorities by placing harmony between humanity and nature at the forefront.

The article emphasises the necessity of a transdisciplinary approach in designing innovative solutions that integrate various perspectives – social, economic, technological, and ecological. Particularly significant is the role of regenerative urban ecosystems, which can serve as laboratories for sustainable living, promoting values such as inclusivity, resilience, and circularity. Future cities have the potential to become key hubs of green transformation through the synergy of local communities, civic activism, and technological innovation.

Key conclusions from the analysis:

1. Holistic approach to transformation – green transformation requires an interdisciplinary and holistic perspective that brings together environmental, social, and economic dimensions. The regenerative model offers a framework for harmonising these areas.

2. Planetocentricity as a core value – integrating planetary environmental objectives into mainstream economic, social, and urban planning decisions is essential for addressing the effects of climate and societal crises.

3. Regenerative urban ecosystems – cities play a vital role in advancing the idea of regenerativity. Through urban and social innovations, they can become models of sustainable living.

4. Importance of local actions and global cooperation – achieving the goals of regenerative development requires international collaboration while accounting for local specificities.

5. Need for new tools and narratives – effective transformation demands the development of new research, design, and communication tools that enable better understanding and implementation of regenerative economies.

The analysis indicates that while regenerative transformation is ambitious and demanding, it presents a significant opportunity to build a more just, sustainable, and resilient world. Its realisation calls for the engagement of all stakeholders – from governments and institutions to local communities and individuals.

References

Attia, S. (2018). *Regenerative and Positive Impact Architecture. Learning from Case Studies*. Cham: Springer.

Ayadi, R., & Sessa, C. (2023). Regenerative Value-Driven Business Ready for Switching to a Wellnessfit Economy: Delivering a Framework for Action. *EMEA Publication Under The Investmed Project – Policy Paper*, *10*. Euro-Mediterranean Economists Association. Retrieved from https://www.enicbcmed.eu/sites/default/files/2023-11/PP_wellness-fit%20economy-n.pdf (16.08.2025)

Barber, B.R. (2014). *Gdyby burmistrzowie rządzili światem*. Warszawa: Warszawskie Wydawnictwo Literackie Muza.

Bińczyk, E. (2018). *Epoka człowieka. Retoryka i marazm antropocenu*. Warszawa: Wydawnictwo Naukowe PWN.

Bińczyk, E. (2024), *Uspołecznianie antropocenu. Ekowerwa i ekologizowanie ekonomii*. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.

Brown, M., Haselsteiner, E., Apró, D., Kopeva, D., Luca, E., Pulkkinen, K.-L. & Vula R.B. (Eds.) (2018). *Sustainability, Restorative to Regenerative. An Exploration in Progressing a Paradigm*

Shift in Built Environment Thinking, from Sustainability to Restorative Sustainability and on to Regenerative Sustainability. COST Action CA16114 RESTORE, Working Group One Report: Restorative Sustainability. Retrieved from https://www.eurestore.eu/wp-content/uploads/2018/04/Sustainability-Restorative-to-Regenerative.pdf (11.04.2025).

Buckton, S.J., Fazey, I., Sharpe, B., Om, E.S., Doherty, B., Ball, P., Bryant, K.M., Lait, R., Bridle, S., Cain, M., Carmen, E., Collins, L., Nixon, N., Yap, Ch., Connolly, A., Fletcher, B., Frankowska, A., Gardner, G., James, A., Kendrick, I., Kluczkovski, A., Mair, S., Morris, B., & Sinclair, M. (2023). The Regenerative Lens: A Conceptual Framework for Regenerative Social-Ecological Systems. *One Earth*, *6*, 824-842. https://doi.org/10.1016/j.oneear.2023.06.006.

Camrass, K. (2020). Regenerative Futures. *Foresight*, 22 (4), 401-415. https://doi.org/10.1108/FS-08-2019-0079.

Camrass, K. (2023). Regenerative Futures. Eight Principles for Thinking and Practice. *Journal of Futures Studies*, 28(1), 89-99. https://doi.org/10.6531/JFS.202309_28(1).0008.

Čegar, S., Drezgić, S., & Čišić, D. (2024). Exploring the Regenerative Economy: A Comprehensive Review of Literature. *Journal of Regenerative Economics*, *1*(1), 1-40. https://doi.org/10.5937/jre2401001C.

Cole, R.J., Oliver, A., & Robinson, J. (2013). Regenerative Design, Socio-Ecological Systems and Co-Evolution, *Building Research & Information*, *41*(2), 237-247. https://doi.org/10.1080/09613218.2013.747130.

Conte, E., & Monno, V. (2016). The Regenerative Approach to Model an Integrated Urban-Building Evaluation Method. *International Journal of Sustainable Built Environment*, *5*, 12-22. https://doi.org/10.1016/j.ijsbe.2016.03.005.

Cunningham, S. (2002). *The Restoration Economy: The Greatest New Growth Frontier. Immediate and Emerging Opportunities for Businesses, Communities and Investors.* San Francisco: Berrett-Koehler Publisher, Inc.

D'Alisa, G., Demaria, F. & Kallis, G. (Eds.). (2020). *Dewzrost. Słownik nowej ery.* Łódź: LangeL – Łucja Lange.

Daly, H.E. (2005). Economics in a Full World. *Scientific American*, *293*, 100-107. https://doi.org/10.1038/scientificamerican0905-100.

Del Borghi, A., Gallo, M., Gagliano, E., & Eleuteri, V. (2024). Regenerative Development Model: A Life Cycle-Based Methodology for the Definition of Regenerative Contribution Units (RCUs). *Sustainability*, *16*, 1264. https://doi.org/10.3390/su16031264.

Dujarier, M.-A. (2016). The Three sociological Types of Consumer Work. *Journal of Consumer Culture*, *16*, 555-571. https://doi.org/10.1177/1469540514528198.

Dumitrescu, L., Bliuc, I., Baran, I., Pescaru, R.-A., & Parincu, P.-D. (2021). Regenerative Design – General Principles and Implementation Strategies in Building Design. *Buletinul Institutului Politehnic Din Iaşi*, *67*(4), 9-21. https://doi.org/10.2478/bipca-2021-0031.

Edwards, A.R. (2010). *Thriving Beyond Sustainability. Pathways to a Resilient Society.* Gabriola: New Society Publishers.

Edwards, F., & Nilstad Pettersen, I. (2023). Speculative design for envisioning more-than-human futures in desirable counter-cities. *Cities*, *142*, 104553. https://doi.org/10.1016/j.cities.2023.104553.

Egmose, J., Jacobsen, S.G., Hauggaard-Nielsen, H., & Hulgårda, L. (2021). The Regenerative Turn. On the Re-Emergence of Reciprocity Embedded in Living Ecologies. *Globalizations*, *18*(7), 1271-1276. https://doi.org/10.1080/14747731.2021.1911508.

Elkington, J. (2020). *Green Swans. The Coming Boom in Regenerative Capitalism.* New York: Fast Company Press.

Farr, D. (2008). *Sustainable Urbanism. Urban Design with Nature.* Hoboken: John Wiley & Sons.

Fayed, L., Elshater, A., & Rashed, R. (2018). Aspects of Regenerative Cities. In S. Kamel, H. Sabry, G.F. Hassan, M. Refat, A. Elshater, A.S. Abd Elrahman, D.K. Hassan, & R. Rashed (Eds.), *Architecture and Urbanism. A Smart Outlook.* Cham: Springer.

Fullerton, J. (2015). *Regenerative Capitalism. How Universal Principles And Patterns Will Shape Our New Economy.* New York: Capital Institute.

Geddes, P., (1915). *Cities in Evolution: An Introduction to the Town PlanningMovement and to the Study of Civics*. University of Michigan Library. Retrieved from https://archive.org/details/citiesinevolutio00gedduoft (11.04.2025).

Gehl, J. (2017). *Miasta dla ludzi*. Kraków: Wydawnictwo RAM.

Geordan, S., Issa, R., Wood, Ch., & Kelman, I. (2022). Regenerative Economics for Planetary Health: A Scoping Review. *International Health Trends and Prospects*, *2*(3), 81-105. https://doi.org/10.32920/ihtp.v2i3.1704.

Gibbons, L.V. (2020a). Moving Beyond Sustainability: A Regenerative Community Development Framework for Co-Creating Thriving Living Systems and Its Application. *Journal of Sustainable Development*, *13*(2), 20-52. https://doi.org/10.5539/jsd.v13n2p20.

Gibbons, L.V. (2020b). Regenerative – The New Sustainable? *Sustainability*, *12*, 5483. https://doi.org/10.3390/su12135483.

Gibbons, L.V. Cloutier, S.A., Coseo, P.J., & Barakat, A. (2018) Regenerative Development as an Integrative Paradigm and Methodology for Landscape Sustainability. *Sustainability*, *10*, 1910. https://doi.org/10.3390/su10061910.

Global Biodiversity Change Indicators. (2025). GEO BON. Retrieved from https://geobon.org/ebvs/indicators/ (17.07.2024).

Godelnik, R. (2021). *Rethinking Corporate Sustainability in the Era of Climate Crisis. A Strategic Design Approach*. New York: Palgrave Macmillan.

Green, J. (2021), *The Anthropocene Reviewed. Essays on a Human-Centered Planet*. London: Ebury Press.

Hickel, J. (2021). *Mniej znaczy lepiej. O tym, jak odejście od wzrostu gospodarczego ocali świat*. Kraków: Karakter.

Hosey, L. (2021). *Kształt zieleni. O estetyce, ekologii i projektowaniu*. Kraków: Wysoki Zamek.

Howard, E. (2015), *Miasta-ogrody jutra*. Gdańsk: Instytut Kultury Miejskiej w Gdańsku, Warszawa: Fundacja Centrum Architektury.

Khan, R.Z., Razak, L.A., & Premaratne, P. (2025). Green Growth and Sustainability: A Systematic Literature Review on Theories, Measures and Future Directions. *Cleaner and Responsible Consumption*, *17*, 100274. https://doi.org/10.1016/j.clrc.2025.100274.

Kuhn, T. (2001). *Struktura rewolucji naukowych*. Warszawa: Fundacja Aletheia.

Lee, H., & Romero, J. (Eds.), (2023). *IPCC: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva: IPCC. https://doi.org/10.59327/IPCC/AR6-9789291691647.

Lyle, J.T. (1994). *Regenerative Design for Sustainable Development*. New York: John Wiley & Sons.

Mang, P., & Reed, B. (2012). *Regenerative Development and Design*. In V. Loftness, D. Haase (Eds.). *Sustainable Built Environments*. New York: Springe. https://doi.org/10.1007/978-1-4614-5828-9_303.

Mang, P., & Reed, B. (2017). Regenerative Development and Design. In R.A. Meyers (Ed). *Encyclopedia of Sustainability Science and Technology*. New York: Springer, p. 8855-8879. https://doi.org/10.1007/978-1-4419-0851-3.

Mang, P., & Reed, B. (2020). *Regenerative Development and Design. A Framework For Evolving Sustainability*. Hoboken: John Wiley & Sons.

Mariussen, Å., Mäenpää, A., Virkkala, S., & Jääskeläinen, J. (2021). *Smart Multi-Level Coordination Towards Green Transformation: GRETA WP2 Report*. https://doi.org/10.13140/RG.2.2.24086.06721.

Meadows, D.H., Meadows, D., Randers, L., Behrens, J., & William, W. (1972). *The Limits to Growth. A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books.

Mehaffy M., & Salingaros, N. A. (2017). *Design for a Living Planet: Settlement, Science, and the Human Future*. Portland: Sustasis Press.

Moreno, C., Allam, Z., Chabaud, D., Gall, C., & Pratlong, F. (2021). Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities. *Smart Cities*, *4*, 93-111. https://doi.org/10.3390/smartcities4010006.

Morseletto, P. (2020). Restorative and Regenerative. Exploring the Concepts in the Circular Economy. *Journal of Industrial Ecology*, *24*(4), 763-773. https://doi.org/10.1111/jiec.12987.

New Amsterdam Climate, Amsterdam Climate Neutral Roadmap 2050 Report. (2021). Municipality of Amsterdam. Retrieved from https://assets.amsterdam.nl/publish/pages/943415/new_amsterdam_climate_report_2021.pdf (11.04.2025).

Newman, P., Beatley, T., & Boyer, H. (2009). *Resilient Cities: Responding to Peak Oil and Climate Change*. Washington DC: Island Press.

Nowacki, C., & Foissac, M. (2022). Regeneration in Action. Toward a New Path for Sustainable Research Projects. In D. Lockton, S. Lenzi, P. Hekkert, A. Oak, J. Sádaba, P. Lloyd (Eds.). *DRS2022: Bilbao*. 25 June - 3 July, Bilbao, Spain. https://doi.org/10.21606/drs.2022.764.

Papanek, V. (2021). *The Green Imperative: Ecology and Ethics in Design and Architecture*. London: Thames & Hudson.

Paris Resilience Strategy. (2018). Retrieved from https://resilientcitiesnetwork.org/downloadable_resources/Network/Paris-Resilience-Strategy-English.pdf (11.04.2025).

Pascual, U., Balvanera, P., Anderson, Ch.B., Chaplin-Kramer, R., Christie, M., González-Jiménez, D., Martin, A., Raymond, Ch.M., Termansen, M., Vatn, A., Athayde, S., Baptiste, B., Barton, D.N., Jacobs, S., Kelemen, E., Kumar, R., Lazos, E., Mwampamba, T.H., Nakangu, B., O'Farrell, P., Subramanian, S.M., van Noordwijk, M., Ahn S., Amaruzaman, S., Amin, A.M., Arias-Arévalo, P., Arroyo-Robles, G., Cantú-Fernández, M., Castro, A.J., Contreras, V., De Vos, A., Dendoncker, N., Engel, S., Eser, U., Faith, D.P., Filyushkina, A., Ghazi, H., Gómez-Baggethun, E., Gould, R.K., Guibrunet, L., Gundimeda, H., Hahn, T., Harmáčková, Z.V., Hernández-Blanco, M., Horcea-Milcu, A.-I., Huambachano, M., Hummel Wicher, N.L., Aydın, C.İ., Islar, M., Koessler, A. K., Japer O. Kenter, J.O., Kosmus, M., Lee, H., Leimona, B., Lele, S., Lenzi, D., Lliso, B., Mannetti, L.M., Merçon, J., Monroy-Sais, A.S., Mukherjee, N., Muraca, B., Muradian, R., Murali, R., Nelson, S.H., Nemogá-Soto, G.R., Ngouhouo-Poufoun, J., Niamir, A., Nuesiri, E., Nyumba, T.O., Özkaynak, B., Palomo, I., Pandit, R., Pawłowska-Mainville, A., Porter-Bolland, L., Quaas, M., Rode, J., Rozzi, R., Sachdeva, S., Samakov, A., Schaafsma, M., Sitas, N., Ungar, P., Yiu, E., Yoshida, Y., & Zent E. (2023). Diverse values of nature for sustainability. *Nature*, *620*, 813-823. https://doi.org/10.1038/s41586-023-06406-9.

Pickett, S.T.A., & Grove, M. (2009). Urban Ecosystems: What Would Tansley Do? *Urban Ecosystems*, *12*, 1-8. https://doi.org/10.1007/s11252-008-0079-2.

Plessis, Ch. du (2012). Towards a Regenerative Paradigm for the Built Environment. *Building Research & Information*, *40*(1), 7-22. https://doi.org/10.1080/09613218.2012.628548.

Plessis, Ch. du (2022). The City Sustainable, Resilient, Regenerative – A Rose by Any Other Name? In R. Roggema (Ed.), *Designing Cities for Regeneration*. Vol 5. *Contemporary Urban Design Thinking*. Cham: Springer. https://doi.org/10.1007/978-3-030-97023-9_2.

Raworth, K. (2021). *Ekonomia obwarzanka. Siedem sposobów myślenia o ekonomii XXI wieku*. Warszawa: Krytyka Polityczna.

Reed, B. (2007). Shifting from 'sustainability' to regeneration. *Building Research & Information*, *35*(6), 674-680. https://doi.org/10.1080/09613210701475753.

Regenerative Economics. (2025). Retrieved from: https://www.regenerativeeconomics.earth/ (19.08.2025).

Regenesis Group Inc. (2025). Retrieved from https://regenesisgroup.com/ (16.07.2024).

RENEW. a manifesto for regenerative design and engineering. (2025) Retrieved from https://www.bath.ac.uk/publications/centre-for-regenerative-design-engineering-for-a-net-positive-world-renew-manifesto/attachments/regenerative-design-engineering-for-a-net-positive-world-centre-manifesto-2025.pdf (17.09.2025).

Report of the World Commission on Environment and Development: Our Common Future. Retrieved from https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf (11.04.2025).

Rifkin, J. (2003). *Wiek dostępu. Nowa kultura hiperkapitalizmu, w której płaci się za każdą chwilę życia*. Wrocław: Wydawnictwo Dolnośląskie.

Rogall, H. (2010). *Ekonomia zrównoważonego rozwoju. Teoria i praktyka*. Poznań: Zysk i S-ka.

Rose, J.F.P. (2019). *Dobrze nastrojone miasto. Czego współczesna nauka, pradawne cywilizacje i ludzka natura mogą nas nauczyć o przyszłości życia w miastach*. Kraków: Karakter.

Sánchez-Cañón, E., Alvarado-Rincón, J.A., Rodríguez, D., Barrera, V.M., Ríos-Moyano, D.K., Lizarazo, C.F. (2025). Conceptualization of Regenerative Rural Development: A Systematic Review. *Sustainability*, *17*, 425. https://doi.org/10.3390/su17020425.

Schuring, S., & Turan, K. (2021). The Concept of a 'Regenerative City': How to Turn Cities into Regenerative Systems. *Journal of Urban Regeneration and Renewal*, *15*(2), 161-175. https://doi.org/10.69554/JWJN3679.

Senge, P,, Smith, B., Kruschwitz, N., Laur, J., & Schley, S. (2008). *The Necessary Revolution. How Individuals and Organizations Are Working Together to Create a Sustainable World*. New York: Doubleday.

Sim, D. (2020). *Miasto życzliwe. Jak kształtować miasto z troską o wszystkich*. Kraków: Wysoki Zamek.

Skrzypczyński, R. (2020). Postwzrost, dewzrost, awzrost… polska terminologia dla różnych wariantów przyszłości bez wzrostu. *Czas Kultury*, *3*, 7-13. Retrieved from: https://czaskultury.pl/wp-content/uploads/2021/03/RSkrzypczynski_PostwzrostDewzrostAwzrost_CzasKultury_3_2020.pdf (11.04.2025).

Szczęsny, J. (2023). *Azyle, nisze i enklawy, czyli katalog małych utopii*. Warszawa: Muzeum Sztuki Nowoczesnej.

Tansley, A.G. (1935). The use and abuse of vegetational concepts and terms. *Ecology 16*, 284–307.

The 17 Goals. (2025). Retrieved from https://sdgs.un.org/goals (9.07.2024).

The Ideal City. Exploring Urban Futures. (2021). Berlin: SPACE10.

The Post Growth Encyclopedia. (2024). Post Growth Institute. Retrieved from: https://postgrowth.org/the-post-growth-encyclopedia/ (12.08.2024).

The Sustainable Development Goals Report 2023: Special Editions. Towards a Rescue Plan for People and Planet, United Nations. United Nations. Retrieved from: https://unstats.un.org/sdgs/report/2023/The-Sustainable-Development-Goals-Report-2023.pdf (11.07.2024).

Transforming Our World: The 2030 Agenda For Sustainable Development. Retrieved from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf (11.07.2024).

Urban Green Transition – transforming our cities for a new reality. (2023). Retrived from https://issuu.com/stateofgreen/docs/sog_whitepaper_cities_210x297_v06_w_9017297efbec06?fr=xKAE9_zJGAA&submissionGuid=cf71c5dd-3062-46dd-866a-666d86b64b7c (1.08.2024).

Urban Regeneration as a Tool for Inclusive and Sustainable Recovery. Report on the Expert Group Meeting. 1 - 2 December 2021. (2022) Retrieved from https://unhabitat.org/sites/default/files/2022/05/report_egm_urban_regeneration.pdf (17.09.2025).

Vince, G. (2022). *Nomad Century: How Climate Migration Will Reshape Our World*. Flatiron Books.

Wahl, D.Ch. (2016). *Designing Regenerative Cultures*. Chicago: Triarchy Press.

Woo, F., Wortmann, J., Schurig, S., & Leidreiter, A. (2014). *Regenerative Urban Development. A Roadmap To The Ci Ty We Need*. Hamburg: World Future Council.

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ORIGINAL PAPER

DETERMINANTS OF HEALTH CARE EXPENDITURE IN POLAND IN THE YEARS 2014-2023

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JEL Classification: H510, I150, I180.

K e y w o r d s: health economics, health care expenditure, public finances, state budget.

A b s t r a c t

This study aimed to assess the development of healthcare expenditure in Poland and identify its determinants. Changes in the structure of this expenditure were analysed, as was its share of Gross Domestic Product (GDP), and the amount of healthcare expenditure per capita in Poland between 2014 and 2023 was calculated and evaluated. During the period under review, healthcare expenditure in Poland was growing, but both its share of GDP and its per capita level were lower than the average in other EU countries The determinants of healthcare expenditure in Poland were identified, dividing them into: legal, macroeconomic, political, unexpected events, demographic, social, environmental, technological, systemic and those resulting from globalisation processes. Determinants were divided into those dependent and independent of the state, pointing to possible ways of dealing with them. The biggest barrier to the growth of healthcare expenditure in Poland is macroeconomic in nature, as it results from the country's GDP. Other significant problems related to the development of healthcare expenditure result from the ageing of the population and systemic errors. During the analysed period, the Covid-19 pandemic was also a significant factor in the development of healthcare expenditure in Poland.

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UWARUNKOWANIA WYDATKÓW NA OCHRONĘ ZDROWIA W POLSCE W LATACH 2014-2023

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Słowa kluczowe: ekonomia zdrowia, wydatki na służbę zdrowia, finanse publiczne, budżet państwa.

Abstrakt

Badania teoretyczne i empiryczne prowadzone w ramach ekonomii zdrowia wskazują, że wysokość wydatków na ochronę zdrowia ma wpływ na stan zdrowia populacji i jakość oferowanej opieki zdrowotnej. W ocenianym okresie wydatki na ochronę zdrowia w Polsce były rosnące, zarówno jednak ich procentowy udział w PKB, jak i ich wysokość per capita, były w Polsce niższe niż średnio w innych krajach UE. Autorka zidentyfikowała uwarunkowania kształtowania się wydatków na ochronę zdrowia w Polsce, dzieląc je na: prawne, makroekonomiczne, polityczne, wynikające z niespodziewanych zdarzeń, demograficzne, społeczne, środowiskowe, technologiczne, systemowe oraz wynikające z procesów globalizacji. Podzieliła je też na zależne oraz niezależne od państwa, wskazując na możliwe sposoby radzenia sobie z nimi. Największa bariera wzrostu wydatków na ochronę zdrowia w Polsce ma charakter makroekonomiczny, gdyż wynika z wypracowanego PKB w kraju. Inne istotne problemy związane z kształtowaniem się wydatków na ochronę zdrowia wynikają ze starzenia się społeczeństwa oraz błędów systemowych. W analizowanym okresie pandemia COVID-19 była także istotnym uwarunkowaniem kształtowania się wydatków na ochronę zdrowia w Polsce.

Introduction

Health and its protection are fundamental goals for every individual, but they should also be a priority for society as a whole. Other factors also influence the health of society, but a well-functioning healthcare system contributes significantly to maintaining and improving the health of the population (Piątkowski, 2021, p. 327). A healthy society, on the other hand, is an important determinant of economic growth and development. A scientific discipline called health economics has developed in economics, which arose as a reaction to the rising costs of healthcare and increasingly frequent problems with its financing. This discipline deals with interpreting and explaining economic processes related to the production and exchange of medical goods and services, and research in this area attempts to identify ways to reduce or at least slow down the growth of healthcare costs (Markowska, 2019, p. 132). In the practical activities of healthcare entities, the use of market economy elements is also becoming increasingly visible, which allows for a more effective and rational use of public funds allocated to healthcare (Beylik *et al*., 2022, p. 2).

The main problem that every healthcare system has to face is finding appropriate and sufficient sources of funding. The starting point is therefore the selection of the most appropriate healthcare financing model. Over the years, four main healthcare models have emerged in practice: the Bismarck model, the Beveridge model, the Siemaszko model and the residual model (Paszkowska, 2017, p. 28). In Poland, the adopted healthcare system operates under the Bismarck model, based on a system of compulsory health insurance contributions. The system is financed by compulsory health insurance contributions paid to the National Health Fund, but also from the state and local government budgets (Kowalczyk, 2015, p. 142). A similar system in Europe operates in the Czech Republic, Austria, Switzerland, Germany, Belgium, the Netherlands and France. It is vulnerable to certain risks due to current demographic and systemic forecasts (Stasiak, 2023, p. 101). It is also greatly limited by the available financial resources. Therefore, research on healthcare expenditure and its determinants is an important issue in economics. Research into the determinants of healthcare expenditure was initiated in 1977 by Newhouse, who considered GDP to be the most important factor. Over the following years, other determinants of healthcare expenditure were also studied, such as population ageing, technological factors, the health status of the population, the supply of healthcare and institutional factors (Martin *et al*., 2011; Łyszczarz & Nojszewska, 2015; Łyszczarz, 2018; Piekut & Gutkowska, 2016; Strzelecka, 2011; Jończyk, 2010; Wasiak & Szeląg, 2015).

The aim of this study was to assess the development of healthcare expenditure in Poland and to identify the factors influencing it. To achieve this objective, the first step was to identify and assess healthcare expenditure in Poland. The study encompassed the period from 2014 to 2023, with a geographical focus on Poland and a subject scope that encompassed healthcare expenditure. Both public and private expenditure trends during the study period were analysed. The dynamics and structure of these expenditures were assessed, and their share in GDP was calculated and evaluated, as well as the amount of healthcare expenditure per capita in Poland. In addition, it points out the main determinants of healthcare expenditure in Poland and those that constitute the greatest barriers to the effectiveness of the healthcare system.

Determinants of Healthcare Expenditure

Healthcare expenditure depends on many factors, which have been analysed by numerous authors for several decades. Over the years, researchers have often focused on analysing individual categories of these determinants, assessing their impact on the formation of healthcare expenditure in a given country. The author of this study has attempted to take a comprehensive look at the determinants of healthcare expenditure. She has divided them into the following categories:

1. Legal conditions: The amount of expenditure on healthcare is regulated by Article 131c of the Act of 27 August 2004 on healthcare services financed from public funds (Dz.U. z 2024 r., poz. 146). According to the regulations, no less than 6.00% of GDP, as specified in the announcement of the President of the Central Statistical Office, should be allocated to healthcare financing. There are also other legal provisions that affect healthcare expenditure, e.g. intra-EU regulations (*Health at a Glance*, 2016). The amount of health insurance contributions and their mandatory nature are also important legal determinants of healthcare expenditure.

2. Macroeconomic conditions: Healthcare expenditure depends on the amount of revenue collected by the state budget, which is a significant constraint in Poland – throughout the entire period under review, there was a budget deficit and numerous problems with financing various areas of the economy, including healthcare. The main factor correlated with healthcare expenditure is GDP (Akca *et al*., 2017, p. 2). Economic growth therefore contributes to increasing the possibilities of financing healthcare, and these expenditures are positively correlated with economic growth. In the long term, they also stimulate the country's economic development by improving the quality of the basic resource in the economy, which is human resources.

3. Political conditions: Since healthcare spending depends on public finances, it follows that it is also conditioned by the fiscal policy pursued and the priority objectives of the government currently in power. Poland also implements the EU's common health policy, which determines national healthcare spending (Iwuoha & Jude-Iwuoha, 2020; Brooks *et al*., 2023; Samarasekera, 2021). This policy assumes the use of other countries' experiences in the field of healthcare and also draws attention to the amount of healthcare expenditure, which is linked to public health indicators.

4. Conditions resulting from unexpected events such as wars, disasters, natural disasters or pandemics. In 2020, the COVID-19 pandemic began, which significantly changed the role of healthcare in society in the following years and forced a significant increase in healthcare spending. According to an OECD report, the COVID-19 pandemic has led to a reduction in average life expectancy in the EU by more than a year in 2021 compared to pre-pandemic levels. By the end of October 2022, more than 1.1 million deaths from COVID-19 had been reported in the 27 EU countries, mainly among the elderly. However, the pandemic also had an impact on the mental and physical health of young people due to disruptions in their education and social activities. The number of cases of depression among young people increased, their level of physical activity decreased, their eating habits deteriorated, and in some countries there was an increase in overweight and obesity among children. The pandemic also disrupted the continuity of cancer screening programmes and specialist consultations, resulting in cancer patients being diagnosed at a later stage. Rising healthcare

expenditure was also due to the launch of the COVID-19 vaccination programme (*Health at a Glance*, 2022).

5. Demographic conditions: On the one hand, there is a decline in population (which should lead to a reduction in healthcare expenditure), but on the other hand, Poland and many other countries are experiencing an ageing population, so the number of age-related diseases is increasing – for this reason, healthcare needs in society are growing, despite the decline in population. Since 2011, the increase in life expectancy has slowed significantly (*Health at a Glance*, 2018). On average, in EU countries, the percentage of the population aged over 65 has increased from less than 10% in 1960 to almost 20% in 2015, and is expected to rise to almost 30% by 2060 (*Health at a Glance*, 2016). This results in growing health needs and fewer people paying contributions (Golinowska & Tabor, 2014; Eenoo *et al*., 2015). After 2022, a large wave of migrants from Ukraine arrived in Poland, which also increased the demand for health services. On the one hand, technological progress over the years has improved the health of the population, but on the other hand, in recent years there has been a massive increase in so-called lifestyle diseases, which require large financial outlays that were not previously necessary, such as metabolic or mental illnesses. In previous decades, there were not so many depressive and anxiety disorders, for example, but today this is a major problem, contributing to an increase in healthcare spending.

6. Social conditions: Over the years, knowledge and social awareness about health and healthy lifestyles have grown, which means that people regularly and often preventively use health services, which in the short term increases healthcare spending. However, in the long term, prevention and greater attention to health should contribute to a reduction in healthcare expenditure. Among the behavioural determinants of the increase in healthcare expenditure, the negative impact of stimulants on human health should also be mentioned. Although the consumption of both tobacco and alcohol declined during the period under review, their consumption remains the largest behavioural risk factor for health, accounting for approximately 780,000 deaths per year in the EU in the case of cigarettes and 300,000 in the case of alcohol (*Health at a Glance*, 2022). Mental health problems are also a significant issue. In 2015, more than 84,000 people died from mental health problems across Europe, and the total costs resulting from mental health problems are estimated at over EUR 600 billion per year (*Health at a Glance*, 2018).

7. Environmental conditions: Climate change and environmental pollution pose another threat to the modern world, leading to the emergence of new diseases and deteriorating public health, which results in increased healthcare spending. In most European countries, pollution levels have remained above WHO guidelines over the past two decades. This is particularly true in large cities (*Health at a Glance*, 2020). It is estimated that more than 300,000 people in the EU died from air pollution caused by fine particulate matter in 2019 (*Health at a Glance*, 2022). Polluted water, air and soil have a direct negative

impact on human health and also indirectly affect the quality of the food we consume as a species.

8. Systemic conditions: these result from the organisation of medical services, the appropriate system of medical staff training and the effective organisation of work in healthcare. Unfortunately, there are indications of shortcomings in this area in Poland – shortage of doctors, an inefficient healthcare system, poor management and the ineffective use of healthcare funds.

9. Technological conditions: The new technologies mentioned above are being used more and more intensively in medicine, which improves the health of the population. Thanks to modern medical equipment, diseases are detected at earlier stages of their development and are treated more effectively. However, the external effects of technological progress also include the development of highly processed foods, which reduce health levels and contribute to rising healthcare costs. On the other hand, technological progress provides greater access to information, raising the level of health literacy among the population. Another consequence of intensive technological development is the so-called fast pace of life, which is the source of many mental illnesses. As already mentioned, their number has been growing rapidly in recent years, increasing the necessary healthcare expenditure.

10. Conditions resulting from globalisation: these lead to the standardisation of people's needs on a global scale, but also increase the openness of economies. In the context of the impact of this phenomenon on healthcare spending, it is worth mentioning the increasingly intensive travel of Poles, which often results in the introduction of various tropical diseases and others that were previously unknown in our country. This is a factor contributing to the increase in healthcare spending.

In consideration of the aforementioned factors, the subsequent sections of this article will analyse the development of healthcare expenditure in Poland, with a view to identifying the most significant factors influencing this development.

Healthcare Expenditure Trends in Poland in 2014-2023

High healthcare spending is not a sufficient condition for the population to enjoy a high level of health and for the quality of healthcare services to be satisfactory, but it is a necessary condition. However, it is widely known that the level of expenditure in the Polish healthcare system is too low in relation to social needs and expectations (Piątkowski, 2021, p. 320). Table 1 shows the level of expenditure in Poland in 2014-2023. In order to assess their development in the period under study, the dynamics of changes in healthcare expenditure were also calculated (% change year-on-year), as presented in Table 2.

Table 1

Healthcare expenditure in Poland in 2014-2023 (in PLN million)

Years	Total current expenditure on health care	Public spending	Private expenses
2014	110,575.2	79,046.0	31,529.2
2015	114,142.4	79,886.6	34,255.8
2016	121,106.7	84,591.5	36,515.2
2017	130,140.4	90,446.0	39,694.4
2018	134,244.4	95,977.1	38,267.3
2019	147,838.5	106,113.9	41,724.6
2020	151,873.5	109,752.7	42,120.8
2021	169,418.4	122,767.2	46,651.3
2022	196,205.1	144,639.4	51,565.7
2023	241,617.4	197,818.2	43,799.2

Source: based on Announcements regarding the National Health Account for 2014-2023 (2023).

Table 2

Dynamics of changes in health care expenditure in Poland in 2014-2023 (in %)

Years	Current expenditure on health care	Public spending	Private expenses
2015/2014	3.23	1.06	8.65
2015/2016	6.10	5.89	6.60
2016/2017	7.46	6.92	8.71
2017/2018	3.15	6.12	-3.60
2018/2019	10.13	10.56	9.03
2019/2020	2.73	3.43	0.95
2020/2021	11.55	11.86	10.76
2021/2022	15.81	17.82	10.53
2022/2023	23.15	36.77	-15.06
2023/2014	118.51	150.26	38.92

Source: own calculations based on the Announcement on the National Health Account for 2014--2023 (2023).

Healthcare expenditure in Poland grew in each of the years examined between 2014 and 2023. The rate of expenditure growth was also mostly increasing. A notable year was 2017, when total healthcare expenditure increased by just over 3% compared to 2016, compared to over 7% growth in the previous year. In that year, private healthcare expenditure fell by over 3.5%. Another notable year was 2020, when healthcare expenditure increased by less than

3% compared to the previous year. This represented a decline in the growth rate of the expenditure examined by more than 7%. Starting in 2021, the rate of change in healthcare expenditure in Poland increased year on year. The largest increase in expenditure occurred in 2023, when it rose by over 23% compared to the previous year, mainly due to an increase in public expenditure (over 36%), while private expenditure fell by over 15%. Throughout the entire period under review, healthcare expenditure in Poland increased by over PLN 130 million in nominal terms, which represents an increase of over 118%. This increase was mainly due to an increase in public healthcare expenditure, which amounted to over PLN 118 million (over 150%). Private healthcare expenditure in Poland increased by only slightly over PLN 12 million (almost 39%). In addition, Table 3 shows the structure of the expenditure examined.

Table 3

Share of public and private in healthcare expenditure in Poland in 2014-2023 [%]

Years	Public spending	Private expenses
2014	71.49	28.51
2015	69.99	30.01
2016	69.85	30.15
2017	69.50	30.50
2018	71.50	28.50
2019	71.78	28.22
2020	72.27	27.73
2021	72.46	27.54
2022	73.72	26.28
2023	81.87	18.13

Source: own calculations based on the Announcement on the National Health Account for 2014-2023 (2023).

In the initial period of the analysed time frame, public expenditure accounted for approximately 70% of total healthcare expenditure in Poland. Since 2018, this structure has been changing towards an increase in public expenditure, with a gradual decline in private expenditure, reaching a distribution in 2023 where public expenditure accounted for over 80% of total healthcare expenditure, while private expenditure accounted for just over 18% of the total. When assessing the development of private healthcare expenditure, it is pointed out that healthcare is treated as a basic good (Łyszczarz, 2018, p. 152). This means that as the population's income increases, demand for healthcare increases, but its growth rates are declining. In order to deepen the discussion on the development of healthcare expenditure in Poland, its share in GDP was assessed and its amount per capita was calculated (Tab. 4).

Table 4

Share of health care expenditure in GDP [%] and health care expenditure per capita in Poland in 2014-2023 (in PLN)

Years	Share of healthcare expenditure in GDP	Health care expenditure per capita
2014	6.40	2,874.0
2015	6.31	2,970.0
2016	6.49	3,151.0
2017	6.52	3,386.0
2018	6.25	3,495.0
2019	6.39	4,178.0
2020	6.43	3,987.0
2021	6.37	4,469.0
2022	6.33	5,195.0
2023	7.07	6,420.0
Mean	6.46	4,012.5

Source: own calculations based on the Announcement on the National Health Account for 2014-2023 (2023) and data from Bank Danych Makroekonomicznych (2025).

During the period under review, healthcare expenditure in Poland averaged 6.46% of GDP. A decline in this indicator was recorded in 2015 (the share of the analysed expenditure in GDP fell by 0.9% at that time), in 2018 (a decrease of 0.27%), in 2021 (a decrease of 0.06%) and in 2022 (a decrease of 0.04%). In the remaining years, the share of healthcare expenditure in GDP was growing, exceeding 7% in 2023. Compared to the EU average, which was 10.4% in 2022, this is not a high result. Poland is still one of the EU countries that spends relatively the least on healthcare.

Between 2014 and 2023, the population declined, which is why healthcare expenditure per capita in the country increased in most of the years studied, averaging over PLN 4,000 per Pole. Only in 2020 did this expenditure fall slightly compared to the previous year. The largest increase in per capita healthcare expenditure was recorded in 2023, when it rose by PLN 1,225 (an increase of over 23% compared to 2021). For comparison, in 2022, the average annual healthcare expenditure per EU citizen was EUR 3,685, an increase of 38.6% since 2014 (in Poland, it was approximately EUR 1,000).

Summary

During the period under review, healthcare expenditure in Poland was on the rise. The largest increase was recorded after 2021. Its structure also changed, with private expenditure being replaced by public. During the period under review,

healthcare expenditure in Poland accounted for an average of 6.46% of GDP, which is below the EU average. Per capita healthcare expenditure in Poland was also lower than in the EU. The determinants of healthcare expenditure were divided into those dependent and those independent (or only slightly dependent) on the state. Factors dependent on the government include macroeconomic, systemic, political and legal factors. The biggest barrier to achieving optimal healthcare expenditure is that resulting from macroeconomic conditions. It has been estimated that by 2027, there will be a shortfall of PLN 60.5 billion to achieve the desired level (*Monitor Finansowania Ochrony Zdrowia*, 2024).

Another problem highlighted in Poland is staff shortages and systemic errors. The rates of avoidable hospital admissions are among the highest in Europe. In Poland, the rates of hospitalisation for conditions that could be effectively treated on an outpatient basis are among the highest in the EU. This is primarily due to the lack of primary and specialist outpatient care services (Stasiak, 2023, p. 106). It would therefore be advisable to develop a system of reforms to improve the functioning of the healthcare system in Poland. It is also important to take measures to prevent the outflow of highly specialised medical staff from our country.

Another important issue that affects healthcare spending is economic policy, especially fiscal policy. In 2014, Poland was still ruled by a coalition of the PO and PSL parties, but in September of that year, power was taken over by the right-wing PIS party, which remained in power until the end of the period under review. The right-wing views of those in power may have influenced the shape of the state budget – it was during this time that, for example, the 500+ programme was introduced, which placed a significant burden on the state budget, which may have caused problems with financing other areas of economic and social life (in 2018, there was a noticeable slowdown in the growth of healthcare spending). Fiscal policy should be focused on increasing healthcare spending and on finding the right mix of public and private funding for healthcare (Strzelecka, 2023).

During the period under review, there were also circumstances over which the state had little influence. First and foremost, this was the outbreak of the Covid-19 pandemic, which led to an increase in healthcare spending. Other factors beyond the state's control in the short term include environmental and technological factors, as well as those resulting from globalisation and European integration (common directives over which a single country such as Poland has no influence). At this point, it is also worth mentioning the migration crisis, one of the consequences of which is the influx of diseases that either never existed in Poland or had already been permanently eradicated thanks to the internal vaccination system. This leads to an increase in healthcare expenditure.

The social conditions surrounding healthcare spending are also important. On the one hand, there is an increasing level of public knowledge and awareness about health, which, in theory, could result in a reduction in healthcare expenditure in the long term. It is also important to consider the so-called "tax

mentality", which is characterised by a reluctance to pay taxes and similar health insurance contributions. This exacerbates the crisis in healthcare financing. Consequently, there is a prevailing necessity for ongoing public education initiatives and systemic enhancements in healthcare systems, with the aim of fostering increased willingness to contribute financially to health insurance.

Demographic problems also constitute a significant barrier to achieving optimal healthcare spending. Compared to other European Union countries, Poland is still perceived as a demographically young country, but the rate of ageing of Poles is higher than in other countries, and therefore the long-term effects of an ageing population will be greater in Poland than in other EU countries. A systemic solution based on a pay-as-you-go mechanism may prove ineffective in the long term because the change in the ratio between the working-age and post-working-age populations poses a serious threat to the stability of the system. It is suggested that in the long term, the pay-as-you-go mechanism should be partially replaced by a capital mechanism, in which each generation would be individually responsible for securing the financial resources for the benefits it uses. In the short term, however, ad hoc solutions are needed to improve the financial situation of the healthcare system as quickly as possible (Stasiak, 2023, p. 109).

In view of the above, further research on the determinants of healthcare expenditure in Poland seems necessary in the context of the desired changes in healthcare financing in the country.

Transleted by Author

References

Akca, N., Sonmez, S., & Yilmaz, A. (2017). Determinants of Health Expenditure in OECD Countries: A decision Tree Model. *Pakistan Journal of Medical Sciences*, *33*(6), 1490-1494. https://doi.org/10.12669/pjms.336.13300.

Announcement on the National Health Account for 2014-2023. (2023). Central Statistical Office, https://stat.gov.pl/wyszukiwarka/?query=tag:narodowy+rachunek+zdrowia (5.07.2025).

Bank Danych Makroekonomicznych. (2025). https://bdm.stat.gov.pl/ (5.07.2025).

Beylik, U., Cirakli, U., Cetin, M., Ecevit, E., & Senol, O. (2022). The Relationship between Health Expenditure Indicators and Economic Growth in OECD Countries: A Driscoll-Kraay Approach. *Frontiers in Public Health*, *10*, 1050550. https://doi.org/10.3389/fpubh.2022.1050550.

Brooks, E., de Ruijter, A., Greer, S.L., & Rozenblum, S. (2023). EU Health Policy in the Aftermath of COVID-19: Neofunctionalism and Crisis-Driven Integration. *Journal of European Public Policy*, *30*(4), 721-739. https://doi.org/10.1080/13501763.2022.2141301.

Eenoo, L.V., Declercq, A., Onder, G., Finne-Soveri, H., Garms-Homolová, V., Jónsson, P.V., Dix, O.H.M., Smit, J.H., van Hout, H.P.J., & van der Roest, H.G. (2016). Substantial Between – Country Differences In Organizing Community Care for the Elderly People in Europe – A Review. *European Journal of Public Health*, *26*(2), 213-219. https://doi.org/10.1093/ eurpub /ckv152.

Golinowska, S., & Tabor, M. (2014). Sources of Health Care Financing. *Public Health and Management*, *12*(3), 205-217. https://doi.org/10.4467/20842627OZ.14.022.3440.

Health at a Glance: Europe 2016. (2016). OECD report. Retrieved from https://health.ec.europa.eu/state-health-eu/health-glance-europe/health-glance-europe-2016_en (15.07.2025).
Health at a Glance: Europe 2018. (2018). OECD report. Retrieved from https://health.ec.europa.eu/state-health-eu/health-glance-europe/health-glance-europe-2018_en (15.07.2025)
Health at a Glance: Europe 2020. (2020). OECD report. Retrieved from https://health.ec.europa.eu/state-health-eu/health-glance-europe/health-glance-europe-2020_en (15/07/2025)
Health at a Glance: Europe 2022. (2022). OECD report. Retrieved from https://health.ec.europa.eu/state-health-eu/health-glance-europe/health-glance-europe-2022_en (15.07.2025).
Iwuoha, J.Ch., & Jude-Iwuoha, A.U. (2020). COVID-19: Challenge to SDGs and Globalization. *Electronic Research Journal of Social Sciences and Humanities*, *12*(3I), 103-115.
Jończyk, P. (2010). The Structure of Health Care Systems and Financing in Poland and Around the World. *Master of Business Administration*, *2*(103), 116-139.
Kowalczyk, M. (2015). Health Care in Poland in 1999-2015. *Scientific Papers of the Częstochowa University of Technology. Management*, *20*(2015), 139-148.
Łyszczarz, B. (2018). Determinants of Health Expenditure in Households in Poland. *National Economy*, *1*(293), 137-157. https://doi.org/10.33119/GN/100572.
Łyszczarz, B., & Nojszewska, E. (2015). Determinants of Health Care Expenditure in Europe. *Annals of the Collegium of Economic Analysis*, *39*, 183-197.
Markowska, E., & Węglińska, S. (2019). Economics of the Health Market and its Financing. *Economic, Legal and Administrative Studies*, *4*, 31-41.
Martín, J.J.M., Puerto Lopez del Amo Gonzalez, M., & Dolores Cano Garcia, M. (2011). Review of the Literature on the Determinants of Healthcare Expenditure. *Applied Economics*, *43*(1), 19-46.
Monitor Finansowania Ochrony Zdrowia, *10*. (2024). Retrieved from https://federacjaprzedsiebiorcow.pl/wp-content/uploads/2024/08/MFOZ-10.pdf (5.07.2025).
National Health Account for 2014-2023. (2023). Central Statistical Office. Retrieved from https://stat.gov.pl/wyszukiwarka/?query=tag:narodowy+rachunek+zdrowia (5.07.2025)
Newhouse, J. (1977). Medical Care Expenditure: A Cross National Survey. *The Journal of Human Resource*, *12*(1), 115-125.
Paszkowska, M. (2017). The Health Care System in Poland – a Change in the Model. *Management Problems*, *15*(3), 25-41. https://doi.org/10.7172/1644-9584.69.2.
Piątkowski, B. (2021). Health Care Expenditure in Poland Compared to Selected Countries in 2010-2019. *Student Journal of Law, Administration and Economics*, *35*(21), 319-332. https://doi.org/10.19195/1733-5779.35.20.
Piekut, M., & Gutkowska, K. (2016). Health Care Expenditure in Households. *Polish Review of Health Sciences*, *1*(46), 36-44.
Samarasekera, U. (2021). New EU Health Program Comes Into Force. *Lancet*, *397*(10281), 1252-1253. https://doi.org/10.1016/S0140-6736(21)00772-8.
Stasiak, M., & Stasiak, J. (2023). Financing Health Care in Poland in the Context of Demographic Changes. In A. Stępniak-Kucharska, M. Kapela (Ed.). *Contemporary Economic Problems – Management and Finance of the Public Secto*, p. 101-111. Płock: College of Economic and Social Sciences.
Strzelecka, A. (2011). Macroeconomic Determinants of Public Expenditure on Health Care. In J. Suchecka (Ed.). *Financing Health Care. Selected Issues*. Warszawa: Wolters Kluwer.
Strzelecka, A. (2023). Trends in Public Health Expenditures – An Important Element in the Decision-Making Process in Health Care. Comparative Analysis. *Management and Quality*, *5*(4), 142-161.
Wasiak, A., & Szeląg, P. (2015). Health Care Expenditure in Poland Compared to European Union Countries in 2007-2011. *Journal of Finance and Financial Law*, *II*(2), 67-85. https://doi.org/10.18778/2391-6478.2.2.06.

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ORIGINAL PAPER

TO PAY OR NOT TO PAY? INVESTIGATING STUDENTS' WILLINGNESS TO PAY FOR CHATGPT

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K e y w o r d s: ChatGPT, artificial intelligence, students, education.

A b s t r a c t

Artificial intelligence (AI) is developing at a dynamic pace, playing an increasingly significant role across various sectors, including education. One widely used AI-based tool is ChatGPT, available in both a free version and a subscription-based variant offering extended functionalities. However, while the rapid adoption of such tools by students is well-documented, there remains a significant gap in the literature concerning the economic behaviours governing this new market, particularly regarding the price sensitivity of student users and the factors influencing their decision to convert from free to paid tiers. The existence of a paid version of this tool prompted a study which investigated students' willingness to incur costs in exchange for additional features, as well as their reactions to potential price changes. The aim of this article is to determine the willingness of economics students to purchase the subscription version of ChatGPT and to analyse their responses to possible price modifications. Moreover, the study addresses the relationship between the perceived quality of the content generated by the tool and students' willingness to pay for the premium version. A quantitative research approach was employed, based on an online survey (CAWI), in which 342 undergraduate and graduate students participated. The questionnaire included items concerning the frequency of ChatGPT usage, the evaluation of the quality of generated content, and the willingness to purchase the paid version under various pricing scenarios. Statistical methods were

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applied for data analysis, including measures of central tendency and correlation tests. The results indicate that ChatGPT is widely used among students – 94.4% of respondents reported using the tool, with the majority (88.9%) opting for the free version. The frequency of usage varied. Price sensitivity analysis revealed that a 25% increase in the price of the cheapest subscription would not significantly affect the decisions of most current paid users. However, a 50% price increase would result in 36.1% of them cancelling their subscription, while a 75% increase would lead to a reduction in the number of subscribers by more than half. Conversely, a 25% price decrease in the cheapest paid version would encourage 16.8% of free users to subscribe; a 50% reduction would increase this share to 42.3%, and a 75% reduction could persuade up to 70% of respondents to purchase the subscription. The article also presents the results of a Spearman's rank correlation analysis, examining the relationship between the perceived quality of ChatGPT's output and the willingness to purchase the paid version in the event of a price reduction. No significant evidence was found to suggest that individuals who rate the quality of ChatGPT responses more highly are more inclined to subscribe to the paid version if the price decreases.

PŁACIĆ CZY NIE PŁACIĆ?
BADANIE GOTOWOŚCI STUDENTÓW DO PŁATNEJ SUBSKRYPCJI CHATGPT

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S ł o w a k l u c z o w e: ChatGPT, sztuczna inteligencja, studenci, edukacja.

A b s t r a k t

Sztuczna inteligencja (SI) rozwija się w dynamicznym tempie, odgrywając coraz większą rolę w różnych obszarach, w tym w sektorze edukacji. Jednym z powszechnie stosowanych narzędzi opartych na SI jest ChatGPT, dostępny zarówno w wersji bezpłatnej, jak i subskrypcyjnej, oferującej rozszerzone funkcje. Szybkie upowszechnianie się takich narzędzi wśród studentów jest dobrze udokumentowane, w literaturze jednak wciąż istnieje znacząca luka dotycząca zachowań ekonomicznych występujących na tym nowym rynku, szczególnie w odniesieniu do wrażliwości cenowej użytkowników-studentów oraz czynników wpływających na ich decyzję o przejściu z wersji bezpłatnej na płatną. Występowanie płatnego wariantu tego narzędzia było przesłanką do przeprowadzenia badań dotyczących identyfikacji skłonności studentów do ponoszenia kosztów w zamian za dodatkowe funkcje tego narzędzia oraz ich reakcji na ewentualne zmiany ceny. Celem artykułu jest określenie gotowości studentów kierunków ekonomicznych do zakupu subskrypcyjnej wersji ChatGPT oraz analiza ich reakcji na potencjalne zmiany jego ceny. W artykule odniesiono się ponadto do kwestii relacji między oceną jakości treści generowanych przez to narzędzie a skłonnością studentów do wykupienia jego wersji premium. W badaniu zastosowano metodę ilościową, opierając się na ankiecie internetowej (CAWI), w której udział wzięło 342 studentów

studiów licencjackich i magisterskich. Kwestionariusz obejmował pytania dotyczące częstotliwości korzystania z ChatGPT, oceny jakości generowanych treści oraz gotowości do zakupu płatnej wersji w różnych scenariuszach cenowych. W analizie danych wykorzystano metody statystyczne, w tym miary tendencji centralnej oraz testy korelacyjne. W toku przeprowadzonych badań ustalono, że ChatGPT jest powszechnie wykorzystywany przez studentów – 94,4% badanych deklaruje korzystanie z tego narzędzia, a większość z nich (88,9%) wybiera wersję darmową. Regularność użytkowania jest zróżnicowana. Po przeprowadzonej analizie wrażliwości cenowej stwierdzono, że podwyżka kosztu najtańszej subskrypcji o 25% nie wpłynęłaby znacząco na decyzje większości użytkowników płatnej wersji, wzrost ceny o 50% skutkowałby jednak rezygnacją 36,1% z nich, a podwyżka o 75% spowodowałaby spadek liczby subskrybentów o ponad połowę. Z kolei spadek ceny najtańszej płatnej wersji o 25% zachęciłby do subskrypcji 16,8% użytkowników wersji darmowej, obniżka o 50% natomiast zwiększyłaby ten odsetek do 42,3%, a redukcja ceny o 75% mogłaby przekonać do zakupu 70% badanych. Artykuł zawiera również wyniki przeprowadzonej analizy korelacji rang Spearmana, za pomocą której badano zależność między oceną jakości treści generowanych przez ChatGPT a skłonnością do zakupu płatnej subskrypcji w przypadku spadku jej ceny. Nie zidentyfikowano przesłanek do stwierdzenia, że osoby, które wyżej oceniają jakość odpowiedzi generowanych przez ChatGPT, są bardziej skłonne do zakupu płatnych wersji tego narzędzia w przypadku spadku jego ceny.

Introduction

Artificial intelligence is revolutionizing contemporary approaches to education by introducing innovative methods of teaching and learning (Farazouli *et al.*, 2023). Through the personalization of educational experiences, access to authentic language materials, and real-time feedback, AI enhances the learning process, contributing to the creation of a more inclusive and effective educational environment (Mohamed, 2024). The growing importance of AI-based tools is reflected in the rapidly expanding market of subscription models, encompassing not only streaming services or software, but also modern educational technologies (Stavropoulos, 2023; Cobzaru & Tugui, 2024).

One example of this trend toward subscription-based models is the paid version of the popular language model – ChatGPT, developed by OpenAI (Andarsari & Suryadi, 2024). However, the introduction of fees for access to more advanced technology raises questions about users' willingness to pay in exchange for enhanced functionality. This decision depends not only on the technological capabilities of the tool but also on individual user preferences and their readiness to invest in digital products and services.

Understanding the factors influencing the decision to opt for paid access to ChatGPT is crucial from the perspective of both technology providers and the academic community. This article aims to determine the willingness of economics students to purchase the subscription version of ChatGPT and to analyse their responses to possible price modifications. Moreover, the study addresses the relationship between the perceived quality of the content generated by the tool and students' willingness to pay for the premium version. The study's findings

may offer valuable insights into the perceived value of artificial intelligence in education and the decision-making mechanisms of young users of emerging technologies.

The central problem this research addresses is the need to understand the characteristics of higher education students' willingness to pay (WTP) for premium generative AI services. As these tools become more sophisticated and their financial models mature, comprehending the value proposition from the student's perspective is paramount for developers, educators, and policymakers alike. Despite the explosion of academic interest in generative AI, a significant gap exists in the literature concerning the economic dimensions of its adoption by students. A burgeoning body of research has begun to explore students' intentions to use AI. These studies have successfully identified key motivating factors for adoption, including the desire to automate routine tasks, save time, and compensate for a lack of experience. The existing literature can explain why a student might want to use a premium tool, but it offers little insight into whether they are able and willing to pay for it (Lupa-Wójcik, 2024).

The transition of generative AI tools like ChatGPT from free services to subscription-based models necessitates a shift in analytical perspective. To understand the dynamics of this new market, this study is grounded in fundamental principles of consumer decision-making theory, primarily the concept of willingness to pay. WTP is a core economic metric that defines the maximum price a consumer is willing to spend for a product or service of a given quality. It serves as a direct measure of the perceived value a user assigns to the enhanced functionalities of a premium tool. By applying this concept, the student is framed not just as a learner, but as a rational economic actor who conducts a cost-benefit analysis before making a purchasing decision. Building upon this foundation, the study also touches upon price elasticity, which measures how demand for a service responds to changes in its price. According to the classical law of demand, an increase in price typically leads to a decrease in demand. This study uses these economic principles to investigate students' sensitivity to various pricing scenarios, providing a nuanced understanding of the decision-making mechanisms at play.

To address the research aims, a quantitative approach was adopted using primary data collected through a structured online questionnaire. The instrument included sections on demographic characteristics, usage frequency, perceived quality of ChatGPT responses, and students' declared readiness to use either the free or paid versions depending on price changes.

The novelty and principal contribution of this research are twofold. First, it is among the initial empirical investigations to analyse WTP of higher education students for premium generative AI tools, directly addressing a critical gap in the current literature. Second, by providing empirical data on the economic valuation of these tools by students, this study offers evidence on the potential for an AI-driven digital and affordability divide in higher education.

The remainder of this article is organized as follows. The next section provides a comprehensive review of the theoretical foundations underpinning this study. The following section details the research design and methodology. It is followed by a section which presents the empirical findings from the data analysis. The last section summarizes and concludes the results of the study, acknowledges its limitations, and proposes future research directions.

Literature Review

Artificial intelligence has gained the status of one of the key directions in the development of modern technologies (Zayoud *et al*., 2023), exerting a significant impact on various areas of life such as business (Arman & Lamiyar, 2023), healthcare (Rahman *et al*., 2024), and education (Baidoo-Anu & Ansah, 2023). It is commonly defined as the ability of machines and computers to think and act in a way that resembles the human mind (Bankar & Lihitkar, 2023). Its development focuses on creating systems that not only analyse and interpret data but also mimic human cognitive processes (Gocen & Aydemir, 2020). A notable advancement in this field is generative artificial intelligence, which – unlike traditional analytical models – not only processes information but also creates new content, ranging from texts and code to images, in response to given prompts (Chan & Tsi, 2024). This field has evolved over decades, and its dynamic growth has been made possible by increasing computational power, access to vast datasets, and continual improvements in machine learning algorithms. These advances allow for increasingly sophisticated content generation and broaden the scope of applications for this cutting-edge technology across different sectors (Strzelecki & ElArabawy, 2024).

A breakthrough moment in the widespread adoption of AI in this form was the release of ChatGPT in November 2022. This AI system is based on an autoregressive language model with over 175 billion parameters, pre-trained on extensive datasets including books, articles, and websites. Its advanced capabilities in generating text, understanding natural language, and maintaining coherent conversation across a wide range of topics surprised many users, attracting a broad audience and generating widespread interest (Kamalov *et al*., 2023; Chan & Hu, 2023).

One area in which ChatGPT has proven particularly useful is education. The use of this language model in higher education has drawn special attention, as the tool can support learning in multiple ways – from generating texts and code to aiding in academic research and assisting with essays, assignments, and academic projects. It allows students to obtain consistent and contextually appropriate responses to their queries, serving as an effective support tool in academic work. However, its growing popularity also poses challenges for higher education institutions that require in-depth analysis (Abbas *et al*., 2024).

An important issue related to the development of ChatGPT is OpenAI's introduction of paid versions. These versions aim to improve user experience by providing access to additional features such as faster response times, priority access during peak usage, and the ability to use the latest large language model – GPT-4 (Hackett, 2023). Despite the availability of a free version, some users opt for a subscription, prompting an analysis of the factors influencing such decisions.

These consumer choices can be better understood through economic theories describing mechanisms for evaluating benefits and costs. In consumer decision-making economics, the concept of willingness to pay plays a key role. It refers to the maximum amount a user is willing to pay for a service or product of a given quality (Wertenbroch & Skiera, 2002). Research into the willingness to purchase the premium version of ChatGPT has been conducted by, among others, Jo (2024). Based on this author's conclusions, it can be stated that the willingness to buy the paid version of this language model is influenced by multiple factors, including the perceived usefulness of the tool, user satisfaction, and perceived risk. Although users who find ChatGPT more useful tend to be more satisfied with its use, perceived utility does not always translate into a willingness to pay for the advanced version. Price elasticity, perceived value, availability of alternatives, and personal traits such as technological innovativeness have a greater impact on the purchasing decision. Additionally, gender, age, and the financial context of users (in the cited study, two groups with different disposable budgets – office workers and students – participated) also play a significant role in willingness to subscribe to the paid version.

In connection with the issue of price and its influence on consumer readiness to purchase the paid version of an AI model, the concept of price elasticity deserves mention. This term refers to the percentage change in demand resulting from a 1% change in price (Fibich *et al*., 2005). According to the classical law of demand, an increase in the price of a service should lead to a decrease in demand (Milewski & Kwiatkowski, 2018). However, in the case of digital tools such as ChatGPT, user responses to price changes may be more complex and depend on a variety of factors. Users may exhibit different levels of price sensitivity depending on their educational and professional needs, as well as their overall satisfaction with the tool. In the context of ChatGPT, the analysis of willingness to purchase a subscription becomes even more relevant when considering price changes that may affect user decisions.

Data and Methods

This study focuses on the use of ChatGPT as a learning support tool among economics students at a university in northeastern Poland. The primary aim is to determine the willingness of economics students to purchase the subscription

version of ChatGPT and to analyse their responses to possible price modifications. Additionally, the study addresses the relationship between the perceived quality of the content generated by the tool and students' willingness to pay for the premium version.

To achieve these aims, a quantitative approach was employed, involving the collection of primary data using a structured survey questionnaire. The study was conducted between the second and fourth quarters of 2024 and included both undergraduate and graduate students.

The data collection process was based on the Computer-Assisted Web Interviewing technique, which ensured broad accessibility and convenience for respondents. Participation in the study was voluntary and anonymous. To ensure content validity, the questionnaire was pre-tested on a small group of students (N = 10) before full deployment. Based on the feedback received, necessary adjustments were made to improve clarity and comprehensibility.

The questionnaire consisted of several sections covering demographic characteristics, frequency and purpose of ChatGPT usage, assessment of the quality of generated content, and declared willingness to use either the free or paid versions of ChatGPT depending on pricing changes. Where appropriate, a five-point Likert scale was used to measure students' attitudes toward various aspects of ChatGPT usage (ranging from "strongly disagree" to "strongly agree").

The final dataset included responses from 342 students. The sample consisted of 209 women and 133 men. In terms of age, 320 participants were between 18 and 25 years old, while 22 belonged to other age groups. Regarding the level of study, 306 respondents were enrolled in undergraduate programs. The participants came from various residential backgrounds: 121 lived in rural areas, 60 in small towns (up to 20,000 inhabitants), 60 in medium-sized towns (20,000-100,000 inhabitants), and 101 in large cities (over 100,000 inhabitants).

Data analysis was conducted using descriptive statistical methods with IBM SPSS Statistics (macOS version). Given the nature of the scales used – an ordinal scale for the independent variable (assessment of ChatGPT response quality on a scale from 0 to 10) and a Likert scale for the dependent variables (willingness to purchase the paid version under various discount scenarios) – the nonparametric Spearman's rank correlation coefficient (rho) was applied. The coefficient allows for the determination of the degree of monotonic association between two ordinal or continuous variables, without assuming a normal distribution of the data. The analysis was carried out separately for each of the three subscription price reduction scenarios: 25%, 50%, and 75%. In each case, the strength and direction of the relationship between quality assessment and willingness to purchase were examined.

The study was designed in accordance with ethical standards, ensuring voluntary participation (respondents could withdraw at any time without consequences), informed consent, and strict confidentiality and anonymity of the data.

The following section of the article, which presents the results of the conducted study, focuses on determining the degree of student willingness to purchase the paid version of ChatGPT under various pricing scenarios, including both price reductions and increases. Additionally, it examines whether users who rate the relevance of ChatGPT's responses more highly are more inclined to invest in the premium subscription. Conducting research on these aspects serves to better understand user decision-making mechanisms and the factors driving demand for paid AI-based services.

Results

The first issue addressed through the conducted survey was to determine what proportion of the surveyed students use ChatGPT in their studies. The vast majority of respondents (94.4%) confirmed that they use ChatGPT, while 5.6% declared otherwise. The responses obtained through the study provide evidence that, in the current academic environment, generative artificial intelligence is widely utilized by students as a learning aid. With the rapid advancement of AI technologies, tools based on language models – such as ChatGPT – have become increasingly popular among university students.

The study also revealed that respondents varied in terms of how frequently they used ChatGPT for their academic work in higher education (see Fig. 1).

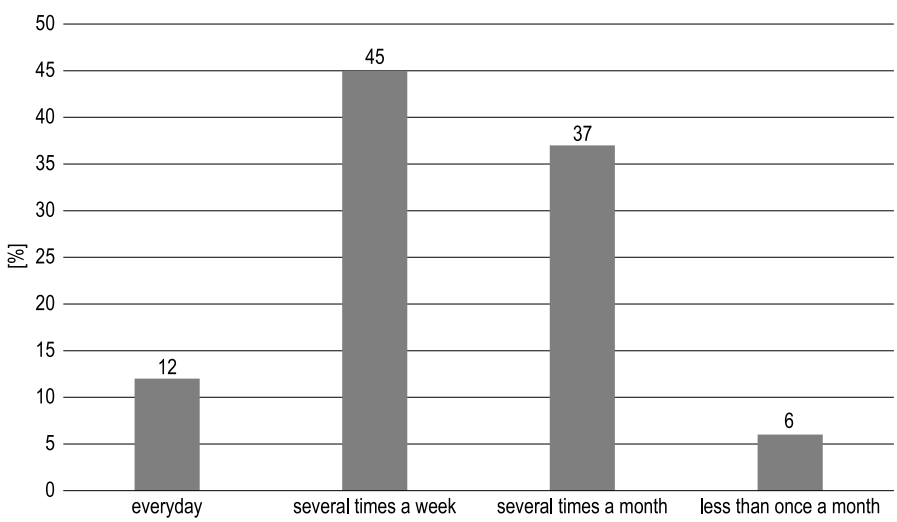

Fig. 1. Frequency of ChatGPT usage (N = 323)

Source: own elaboration.

According to respondents, 45% use the tool several times a week, while 12% use it daily. These results indicate that students are (relatively) regular users of ChatGPT. Nearly 4 out of 10 individuals use the tool several times a month.

The quality of tools used by learners – both actual and perceived – can influence students' academic performance. Therefore, an important aspect of user behaviour in relation to ChatGPT is how they evaluate the content generated by artificial intelligence (see Fig. 2).

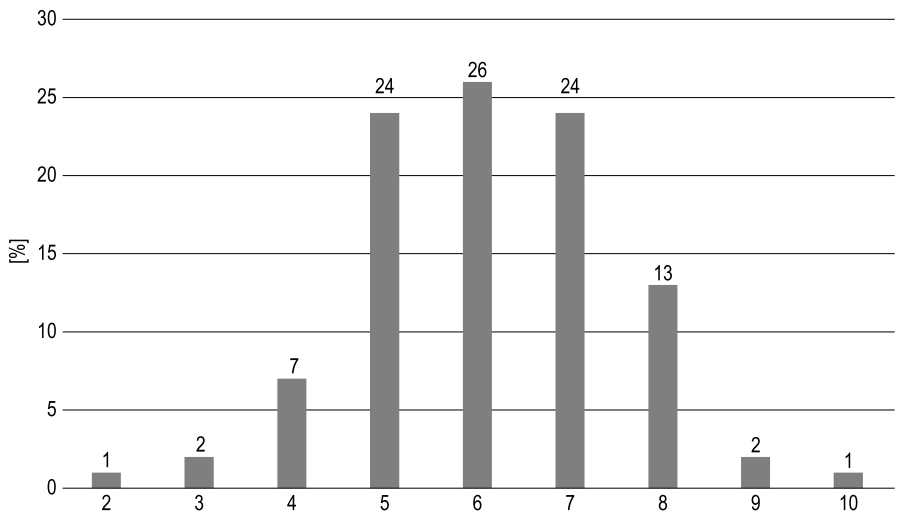

Fig. 2. Perceived quality of ChatGPT-generated content according to users (N = 323)
Source: own elaboration.

The results regarding the perceived quality of content generated by ChatGPT indicate a key factor influencing students' decisions to use the tool. Although detailed data on quality assessment were collected, further analysis is required to fully interpret the findings.

ChatGPT offers a range of features that vary depending on the version used. The free version provides users with fewer capabilities compared to the paid versions. Among the students who use ChatGPT (N = 323), 88.9% reported using the free version, while 11.1% indicated they use a paid version. This demonstrates the significantly higher popularity of the free tool among students. This may be attributed to both financial constraints commonly faced by this user group and the perception that the basic features offered by the free version are sufficient for meeting their academic needs.

In addition to identifying the proportion of students using paid versions of ChatGPT, the survey included a series of questions referring to the concept of price sensitivity – specifically, how changes in the tool's price may potentially influence decisions about its continued use, whether to remain with the current

version or switch from free to paid and vice versa. Thus, the study drew on the concept of willingness to pay, which concerns the maximum amount a user is willing to pay for a given good or service. In the context of this study, WTP may depend, among other factors, on the value that students perceive ChatGPT to provide in support of their education.

For students using the paid version of ChatGPT, three price increase scenarios were examined to determine the likely user response if the cost of access were to rise by 25%, 50%, or 75% (see Tab. 1).

Table 1

Price sensitivity of paid ChatGPT users ($N = 36$)

Option	Price increase by 25%		Price increase by 50%		Price increase by 75%	
	No	%	No	%	No	%
Strongly disagree	–	–	3	8.3	12	33.3
Disagree	1	2.8	4	11.1	5	13.9
Rather disagree	2	5.6	6	16.7	4	11.1
Hard to say	9	25.0	9	25.0	5	13.9
Rather agree	8	22.2	6	16.7	3	8.3
Agree	9	25.0	3	8.3	3	8.3
Strongly agree	7	19.4	5	13.9	4	11.1

Source: own elaboration.

Among users of the paid version ($N = 36$), responses varied depending on the extent of the price increase. A 25% price increase would be acceptable to 66.6% of respondents, while 8.4% stated they would no longer use the paid version under such circumstances. In the case of a 50% price increase, acceptance drops: 38.9% of students would still choose to subscribe, whereas 36.1% reported they would discontinue their subscription. With a 75% increase in price, 58.3% of respondents indicated they would not use the paid version of ChatGPT, highlighting a considerable sensitivity to price hikes among students.

The second part of the sample – those who do not currently use the paid versions of ChatGPT – were asked to indicate how they would respond to a reduction in the price of the most affordable paid version of ChatGPT (see Tab. 2).

A 25% reduction in the price of the most affordable paid version of ChatGPT would receive a positive response from 16.8% of students, while the majority (64%) stated that it would not change their decision regarding the use of the paid version. More substantial price reductions would lead to a noticeable increase in interest – if the price were reduced by 50%, 42.3% of students would be willing to use the paid version, while a 75% reduction would increase the number of potential subscribers to 70%.

Table 2

Price sensitivity of free ChatGPT users (N = 286)

Option	Price decrease by 25%		Price decrease by 50%		Price decrease by 75%	
	No	%	No	%	No	%
Strongly disagree	76	26.6	46	16.1	26	9.1
Disagree	50	17.5	28	9.8	12	4.2
Rather disagree	57	19.9	49	17.1	16	5.6
Hard to say	55	19.2	42	14.7	32	11.2
Rather agree	34	11.9	60	21.0	46	16.1
Agree	8	2.8	45	15.7	42	14.7
Strongly agree	6	2.1	16	5.6	112	39.2

Source: own elaboration.

The next stage of the study involved testing the following hypothesis: "students who rate the quality of ChatGPT responses more highly are more likely to purchase the paid version of the tool in the event of a price reduction". The independent variable – ChatGPT quality rating – was measured on an ordinal scale from 0 to 10. The dependent variable was the willingness to purchase the paid version of the tool under three price reduction scenarios: 25%, 50%, and 75%. Each scenario was rated using a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Since all variables were ordinal in nature, Spearman's rank correlation (ρ) was applied to assess the strength and direction of the monotonic relationship between variables. The analysis was carried out separately for each of the three price reduction scenarios. Table 3 presents the results of the Spearman's rank correlation between the quality assessment and the willingness to purchase the paid version of ChatGPT, depending on the level of price reduction.

Table 3

Spearman's rank correlation (ρ) between perceived quality of ChatGPT responses and willingness to purchase the paid version depending on the level of price reduction

Price reduction scenario [%]	Spearman's rho (ρ)	p-value (Sig. 2-tailed)	Statistical significance
25	–0.006	0.916	no
50	0.007	0.907	no
75	0.098	0.098	no

Source: own elaboration.

In none of the cases was a statistically significant correlation found between the perceived quality of ChatGPT-generated responses and the willingness to purchase the paid version of the tool. The correlation coefficients were very

low – close to zero – indicating a lack of a meaningful monotonic relationship between the variables under analysis. The highest, though still statistically insignificant, correlation was observed in the scenario with the largest price reduction (75%), where $\rho = 0.098$ and $p = 0.098$. In the other two scenarios, the correlations were near zero and entirely non-significant ($p > 0.90$).

Based on the conducted analysis, the research hypothesis – that higher ratings of the quality of ChatGPT responses would be associated with a greater willingness of students to purchase the paid version in the event of a price reduction – was not confirmed. Within the examined sample ($N = 286$), no significant relationship was found between perceived quality and willingness to subscribe, regardless of the proposed discount level.

Possible explanations for this result may include factors unrelated to quality perception, such as individual preferences, needs, financial constraints, or even lack of awareness of the paid version. The findings suggest that perceived quality alone may not be a sufficient motivator for purchase, even when substantial discounts are offered.

Summary and Conclusions

The aim of the research, the results of which are presented in this article, was to determine the willingness of economics students to purchase the subscription version of ChatGPT and to analyse their responses to possible price modifications. Moreover, the study addresses the relationship between the perceived quality of the content generated by the tool and students' willingness to pay for the premium version. Data was collected through a survey using a non-random sampling method, involving 342 students from a single higher education institution located in Poland. The obtained data and analytical results suggest that the development of artificial intelligence has led to a change in the conditions of studying and an evolution in the types of tools used by students for learning. Nearly 95% of respondents declared using ChatGPT to complete tasks related to their university studies. This indicates that artificial intelligence has become a widely used educational aid. Its popularity is also evidenced by the fact that 57% of students pose queries to ChatGPT daily or several times a week, while nearly 40% use the tool several times a month.

The perceived quality of content generated by ChatGPT, rated on a scale from 0 to 10, is as follows: 10% of respondents gave ratings below 5, 50% chose the middle values of the scale (5 or 6), and 40% rated the quality above 6, with only 3% selecting the highest ratings (9 or 10).

A key theme of the study was to identify the behaviours of participants regarding the choice between the free and paid versions of ChatGPT and their potential reactions in the event of price changes for the cheapest paid version.

Most respondents (88.9%) use the free version, which – given the current price of the lowest-tier paid version – indicates a low level of willingness to pay. This may be due to significant financial barriers or a lack of belief in the added value offered by premium features.

For this group, survey questions included three hypothetical price reduction scenarios (25%, 50%, and 75%), while those using the paid version answered questions with three price increase scenarios (25%, 50%, and 75%). In the first group, a 25% price drop would result in a positive reaction from 16.8% of students (who stated they would subscribe at this price point). At a 50% reduction, 42.3% indicated they would start using the paid version, and at a 75% drop, 70% expressed willingness to subscribe. Alternative scenarios were considered by current paid users. In this subgroup, a 25% price increase would lead 8.4% of them to cancel their subscription. At a 50% price increase, this figure would be 36.1%, and in the event of a 75% increase, 58.3% would stop using the paid version.

Statistical analysis did not confirm a hypothesized relationship between the perceived quality of ChatGPT-generated responses and the willingness to purchase the paid version at various discount levels ("students who rate the quality of ChatGPT responses more highly are more likely to purchase the paid version of the tool in the event of a price reduction"). In all three discount scenarios (25%, 50%, 75%), Spearman's rank correlation coefficients were very low and did not reach statistical significance. The highest, albeit still insignificant, correlation ($\rho = 0.098$; $p = 0.098$) was observed in the largest price reduction scenario.

The results suggest that a positive perception of the quality of ChatGPT's responses is not a sufficient motivating factor for purchasing the premium version of the tool, even with significant price reductions. It can be assumed that purchasing decisions are determined by other factors, such as individual needs, usage frequency, availability of alternatives, perceived added value of the paid version, or financial barriers.

The results of this study offer contributions to economic theory and practical application, providing critical insights into student consumer behaviour and informing stakeholders in the educational technology sector. The results challenge the applicability of traditional technology adoption models that weigh perceived usefulness (quality) as a primary driver for adoption. For practice, the results offer insights for key stakeholders. For AI developers, the data clearly indicates that the current pricing model is a significant barrier for the student market. This suggests that a tiered, lower-cost student subscription plan could increase market penetration and adoption. For university administrators and policymakers, the findings provide concrete evidence of an emerging AI affordability divide, where access to superior learning tools is dictated by students' financial capacity. This strengthens the case for negotiating institutional licenses to ensure equitable access for all students, mitigating socioeconomic disparities in educational outcomes. Finally, for educators, the study underscores

the importance of recognizing that most students are likely using the less advanced, free versions of these tools, a critical consideration for assignment design and academic expectations.

These conclusions indicate a need for further research that includes a broader range of psychological, behavioural, and contextual variables that may influence consumer decisions regarding paid AI-based services. Future studies should involve a more diverse group of students – covering different fields of study and universities. It is also recommended to conduct mixed-method research, combining quantitative and qualitative approaches, including in-depth individual interviews or focus groups. Regarding research themes, it would be valuable to examine the effectiveness of AI use in relation to academic performance.

The conducted study is characterized by limitations in the sample selection, which was not fully representative of the entire population of students in Poland. Additionally, the data collection technique (CAWI) meant that respondents filled out the survey form independently, and some responses were declarative in nature. Therefore, it is important to consider the risk of subjective response bias, and no qualitative follow-up (such as interviews) was conducted to deepen the findings.

Translated by Dominika Kuberska

References

Abbas, M., Jam, F.A., & Khan, T.I. (2024). Is it Harmful or Helpful? Examining the Causes and Consequences of Generative AI Usage Among University Students. *International Journal of Education Technology in Higher Education*, *21*(10). https://doi.org/10.1186/s41239-024-00444-7.

Andarsari, F., & Suryadi, N. (2024). Understand the Role of User-Generated Content on Purchase Intention of ChatGPT Premium in Undergraduate Student. *International Journal of Research in Business and Social Science*, *13*(3), 97-108. https://doi.org/10.20525/ijrbs.v13i3.3430.

Arman, M., & Lamiyar, U.R. (2023). Exploring the Implication of ChatGPT AI for Business: Efficiency and Challenges. *International Journal of Marketing and Digital Creative*, *1*(2), 64-84. https://doi.org/10.31098/ijmadic.v1i2.1872.

Baidoo-Anu, D., & Ansah, L.O. (2023). Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in Promoting Teaching and Learning. *SSRN*. Retrieved from http://dx.doi.org/10.2139/ssrn.4337484 (1.05.2025).

Bankar, R.S., & Lihitkar, S.R. (2023). Artificial Intelligence-Based Utility Tools for Research Communication: A Brief Overview. *Proceedings of National Conference*, Shivaji University, Kolhapur: Prarup Publication, 251-262. Retrieved from https://www.researchgate.net/profile/Ravindra-Bankar-2/publication/372954879_Artificial_Intelligence-Based_Utility_Tools_for_Research_Communication_A_Brief_Overview/links/64f0442cf850d430c36b0188/Artificial-Intelligence-Based-Utility-Tools-for-Research-Communication-A-Brief-Overview.pdf (1.05.2025).

Chan, C.K.Y., & Hu, W. (2023). Students' Voices on Generative AI: Perceptions, Benefits, and Challenges in Higher Education. *International Journal of Educational Technology in Higher Education*, *20*(43). https://doi.org/10.1186/s41239-023-00411-8.

Chan, C.K.Y., & Tsi, L.H.Y. (2024). Will Generative AI Replace Teachers in Higher Education? A Study of Teacher and Student Perceptions. *Studies in Educational Evaluation*, *83*, 101395. https://doi.org/10.1016/j.stueduc.2024.101395.

Cobzaru, P., & Tugui, A. (2024). The Subscription Economy and Its Contribution to the Global Economy. *Management Studies*, *12*(3), 137-145. https://doi.org/10.17265/2328-2185/2024.03.001.

Farazouli, A., Cerratto-Pargman, T., Bolander-Laksov, K., & McGrath, C. (2023). Hello GPT! Goodbye Home Examination? An Exploratory Study of AI Chatbots Impact on University Teachers' Assessment Practices. *Assessment & Evaluation in Higher Education*, *49*(3), 363-375. https://doi.org/10.1080/02602938.2023.2241676.

Fibich, G., Gavious, A., & Lowengart, O. (2005). The Dynamics of Price Elasticity of Demand in the Presence of Reference Price Effects. *Journal of the Academy of Marketing Science*, *33*, 66-78. https://doi.org/10.1177/0092070304267108.

Gocen, A., & Aydemir, F. (2020). Artificial Intelligence in Education and Schools. *Research on Education and Media*, *12*(1), 13-21. https://doi.org/10.2478/rem-2020-0003.

Hackett, C. (2023). OpenAI's ChatGPT Plus: An Electronic Resources Librarian's Review. *Journal of Electronic Resources Librarianship*, *35*(4), 299-314. https://doi.org/10.1080/1941126X.2023.2271373.

Jo, H. (2024). Uncovering the Reasons Behind Willingness to Pay for ChatGPT-4 Premium. *International Journal of Human–Computer Interaction*, *41*(2), 994-1009. https://doi.org/10.1080/10447318.2024.2307692.

Kamalov, F., Santandreu Calonge, D., & Gurrib, I. (2023). New Era of Artificial Intelligence in Education: Towards a Sustainable Multifaceted Revolution. *Sustainability*, *15*(16), 12451. https://doi.org/10.3390/su151612451.

Lupa-Wójcik, I. (2024). Students' Willingness to Pay for Access to ChatGPT. *European Research Studies Journal*, *XXVII*(3), 730-745. https://doi.org/10.35808/ersj/3462.

Milewski, R., & Kwiatkowski, E. (2018). *Podstawy ekonomii*. Warszawa: Wydawnictwo Naukowe PWN.

Mohamed, A.M. (2024). Exploring the Potential of an AI-Based Chatbot (ChatGPT) in Enhancing English as a Foreign Language (EFL) Teaching: Perceptions of EFL Faculty Members. *Education and Information Technologies*, *29*, 3195-3217. https://doi.org/10.1007/s10639-023-11917-z.

Rahman, Md.A., Victoros, E., Ernest, J., Davis, R., Shanjana, Y., & Islam, Md.R. (2024). Impact of Artificial Intelligence (AI) Technology in Healthcare Sector: A Critical Evaluation of Both Sides of the Coin. *Clinical Pathology*, *17*, 1-5. https://doi.org/10.1177/2632010X241226887.

Stavropoulos, A. (2023). *Assessing the Impact of Transitioning to a Freemium Subscription-Based Model on Public Sentiment and the Use of Large Language Models in Sentiment Analysis*. Rotterdam: Erasmus University Rotterdam. Retrieved from hdl.handle.net/2105/66699 (1.05.2025).

Strzelecki, A., & ElArabawy, S. (2024). Investigation of the Moderation Effect of Gender and Study Level on the Acceptance and Use of Generative AI by Higher Education Students: Comparative Evidence from Poland and Egypt. *British Journal of Educational Technology*, *55*(3), 1209-1230. https://doi.org/10.1111/bjet.13425.

Wertenbroch, K., & Skiera, B. (2002). Measuring Consumers' Willingness to Pay at the Point of Purchase. *Journal of Marketing Research*, *39*(2), 228-241. Retrieved from: http://www.jstor.org/stable/1558488 (1.05.2025).

Zayoud, M., Oueida, S., Awad, P., & Ionescu, S. (2023). Impact of ChatGPT on Education: Challenges and Opportunities. *11th International Conference of Management and Industrial Engineering*, *11*, 75-82. Retrieved from: https://www.researchgate.net/publication/376707722_IMPACT_OF_CHATGPT_ON_EDUCATION_CHALLENGES_AND_OPPORTUNITIES/link/65aad0def323f74ff1cf02e8/download?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19 (1.05.2025).

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ORIGINAL PAPER

APPLICATION OF METHODS OF TWO-DIMENSIONAL DATA ANALYSIS BASED ON OBSERVATION DEPTH MEASURE IN A SAMPLE

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JEL Classification: C02, C10, Z32.

K e y w o r d s: transport infrastructure, robust data analysis methods, observation depth measure in a sample.

A b s t r a c t

In Poland, cycling is becoming increasingly popular as a fast form of transport and recreation. The aim of this study was to assess the density of bicycle paths and the percentage of road accidents involving bicycles as the responsible vehicle in voivodeships, using selected statistical methods based on observation depth measure in a sample. The methods used allowed for the ranking of voivodeships in terms of the values of the diagnostic features studied and the identification of voivodeships with the lowest or highest values of bicycle path density and the percentage of road accidents in which a bicycle was the vehicle responsible. Based on the analysis, it can be concluded that the highest density of bicycle paths in the years under study was recorded in the Pomorskie, Wielkopolskie, and Śląskie voivodeships, while the highest percentage of road accidents in which a bicycle was the perpetrator was recorded in the Małopolskie and Podkarpackie voivodeships. The lowest density of bicycle paths was recorded in the Warmińsko-Mazurskie voivodeship.

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ZASTOSOWANIE METOD DWUWYMIAROWEJ ANALIZY DANYCH OPARTYCH NA MIARACH ZANURZANIA OBSERWACJI W PRÓBIE

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Kody JEL: C02, C10, Z32.

S ł o w a k l u c z o w e: infrastruktura transportowa, odporne metody analizy danych, miara zanurzenia obserwacji w próbie.

A b s t r a k t

W Polsce zauważyć można coraz większą popularność jazdy na rowerze, który stał się szybką formą transportu oraz rekreacji. Celem pracy jest ocena gęstości dróg rowerowych oraz odsetka wypadków drogowych, gdzie rower jest rodzajem pojazdu sprawcy w województwach wykorzystując wybrane metody statystycznych oparte na zanurzania obserwacji w próbie. Wykorzystane metody pozwoliły na dokonanie rangowania województw ze względu na wartości badanych cech diagnostycznych oraz na określenie, w których województwach zanotowano najniższe lub najwyższe wartości gęstości dróg dla rowerów oraz odsetka wypadków drogowych, gdzie rower był pojazdem sprawcy. Na podstawie przeprowadzonej analizy można stwierdzić, że największą gęstością dróg dla rowerów w badanych latach charakteryzowało się województwa pomorskie, wielkopolskie oraz śląskie, natomiast największy odsetek wypadków drogowych, gdzie rower był pojazdem sprawcy zanotowano w województwach małopolskim oraz podkarpackim. Najmniejszą gęstością dróg dla rowerów charakteryzowało się województwo warmińsko-mazurskie.

Introduction

Cycling infrastructure is developing very rapidly in Poland. Statistics Poland (*Główny Urząd Statystyczny*, GUS) defines a cycle path as "*a path or part of a road that is not a carriageway, which is marked with appropriate road signs, and is intended for the movement of bicycles, electric scooters and personal transport devices, as well as persons moving with the aid of mobility aids in cases provided for by the Act*". Cycle paths in Poland include lanes enabling bicycle traffic on roads, or specially designated bicycle routes (GUS, 2024).

Cities in Poland are increasingly adopting bicycle-friendly policies. Various strategies and documents support this trend, including the Road Traffic Law, regulations issued by the Minister of Transport and Maritime Economy, the European Strategy for Low-Emission Mobility, and other related bicycle traffic guidelines (Hyła, 2023, p. 13-15).

One can observe the growing popularity of cycling, which has evolved not only into a means of transportation but also an enjoyable and active form of leisure. In 2021, Statistics Poland conducted a survey among households on the participation of Poles in sports and physical recreation. Almost 80% of households

had a bicycle, and cycling was a common leisure activity (with over 60% of people participating in this form of recreation). For the period from 1 October 2020 to 30 September 2021, expenditure on bicycles amounted to PLN 92 per household (GUS, 2022).

The bicycle is a means of transport often used by the public. It should be noted, however, that cycling is not the safest form of transport. According to a report presented by the Traffic Department of the Gdańsk City Police Headquarters, the number of traffic accidents involving cyclists, in which they are the victims, is still significant. Although most people assessed the safety of cycling on cycle paths as good, cycling safety is influenced not only by cycling infrastructure but also by traffic regulations and the popularity of cycling (Sommer & Zakrzewski, 2021, p. 313-333).

A frequently used method of transport in urban environments is the city bicycle system. The use of this mode of transport significantly reduces travel time in the city and relieves pressure on trams and buses. Polish cities are increasingly promoting this mode of transport. A positive aspect is the fact that the city bicycle system is easy to use and user-friendly (Dębowska *et al.,* 2017).

The objective of this study is to assess the density of cycle paths and the percentage of road accidents in which a bicycle is the vehicle of the party at fault across voivodeships, using selected statistical methods based on observation depth measure in a sample. The relevant computations and figures were produced using the Statistica PL program and appropriate R environment packages.

Research Methodology

Statistical methods enable the analysis of economic phenomena and the identification of patterns that govern them. To this end, methods based on classical or positional characteristics can be used. In a data set, there are sometimes observations that are distant from the others (atypical) due to high or low values of diagnostic features. At the beginning of data analysis, it is essential to identify and address these observations, either by eliminating them or applying robust data analysis methods to mitigate their impact. The use of classical statistical methods that are not robust to the occurrence of outliers may distort statistical analysis and lead to incorrect conclusions. Methods for detecting outliers in multi-dimensional samples have been explored by Heilpern (2005) and Pawełek & Zeliaś (1996). Additionally, robust data analysis methods have been discussed by Maronna *et al.* (2019) and others.

Statistical methods based on observation depth measure in a sample are robust methods increasingly used in statistical data analysis. They can be used to determine statistical measures, perform statistical inference, rank and order multi-dimensional observations, or detect outliers. By using observation depth

measure in a sample, it is possible to assess the distance of an observation from the centre of the data set under analysis (Kosiorowski, 2012; Mosler, 2013, p. 17-34; Mosler & Mozharovskyi, 2022, p. 348-368). Selected methods concerning observation depth measure in a two-dimensional sample have been described by Wagner and Kobylińska (2002), among others.

The concept of observation depth measure in a sample was introduced by Tukey (Tukey, 1975, p. 523-531). Statistical methods based on observation depth measure in a sample have been widely discussed in the literature on the subject and are increasingly used in statistical data analysis. They require, however, that certain related concepts be introduced.

Let us assume that a two-dimensional set is being analysed $P_n^2 \in = \{x_1, x_2, \ldots x_n\}$, where each vector is x_i regarded as a point in a 2-dimensional space. In this study, data analysis was conducted for each point belonging to two-dimensional data sets. Liu's simplex depth measure ($Lzan_2$) for point θ in a sample P_n^2 is used to denote the function:

$$Lzan_2(\theta, P_n^2) = N_3^{-1} \sum_{1 \le i < j < k \le n} \mathrm{I}\left[\theta \in \Delta\left(x_i, x_{j,} x_k\right)\right], \tag{1}$$

where $\Delta(x_i, x_j, \ldots x_k)$ are closed simplices such that $x_i, x_j, \ldots x_k \in P_n^2$. N_3 specifies the number of all the simplices that can be constructed from the elements of the sample P_n^2, whereas I(A) is an indicator function that takes the value of 1 if the point θ belongs to simplex $\Delta(x_i, x_j, \ldots x_k)$, or the value of 0 in the opposite case (Liu, 1990, p. 405-414; Liu *et al*., 1990).

The values of observation depth measure in a sample belong to the range of <0; 1>. The observation corresponding to the higher depth measure value is situated more centrally in the data set under study. The lowest values of these measures correspond to the observations that are most distant from the data set centre due to low or high values of diagnostic features (Struyf & Rousseeuw, 2000, p. 415-426).

Let us assume that k is the minimum number of points in the sample P_n^2, belonging to a two-dimensional half-plane, whose dividing line passes through the point θ. Point θ does not necessarily belong to the sample P_n^2.

The set $R(k) = \{\theta: zan_p(\theta, P_n^2) \ge k\}$, where $zan_p(\theta, P_n^2)$ defines the depth of point θ in sample P_n^2 is called the area enclosed by the contour of the k-th degree of depth. The depth contours are determined as the common part of all half-planes with the k-th degree of depth. Depth contour figures are convex and ascending polygons. An observation situated inside a particular contour has a depth value higher than k, whereas if it lies outside the contour, it has a depth value lower than k. A particular observation corresponds to a depth value equal to k if it belongs to the edge of the contour with a k-th degree of depth (Ruts & Rousseeuw, 1996, p. 153-168).

In the present article, statistical analysis for two-dimensional data was enhanced with methods based on observation depth measure in a sample. The mrfDepth package for the R environment, developed by Pieter Segaert, Mia Hubert, Peter Rousseeuw, Jakob Raymaekers and Kaveh Vakili, was used to determine Liu's simplex depth measure values and to produce depth contour plots.

Analysis of the findings

The present study utilised data on the length of cycle paths and the percentage of road accidents where a bicycle was the vehicle of the party at fault in the years 2018 and 2023. The data was sourced from the Local Data Bank of Statistics Poland.

The analysis used secondary data concerning:

– X18 – density of cycle paths in 2018 (expressed as km per 100 km^2),

– X23 – density of cycle paths in 2023 (expressed as km per 100 km^2),

– Y18 – the percentage of road accidents where a bicycle is the vehicle of the party at fault in 2018 (%),

– Y23 – the percentage of road accidents where a bicycle is the vehicle of the party at fault in 2023 (%).

Firstly, a statistical analysis of the data was conducted using the Statistica PL programme. Figures were produced to illustrate the distributions of the analysed variables and the correlation between them.

Based on the values of the studied variables (Tab. 1), the lowest densities of cycle paths per 100 km^2 in the years under study were noted in Podlaskie, Świętokrzyskie and Warmińsko-Mazurskie voivodeships, where, in 2018, the cycle path density was less than 3 km per 100 km^2. In another year under study, the density of cycle paths in the above-mentioned voivodeships increased by over 50%, with the highest increase of 81.78% in Świętokrzyskie Voivodeship. The highest density of cycle paths in the years under study was noted in Śląskie Voivodeship, where, in 2023, there were almost 12 km of such paths per 100 km^2. Compared to Warmińsko-Mazurskie Voivodeship, the density of cycle paths was more than three times higher. In terms of cycle path density, four voivodeships ranked highest (Kujawsko-Pomorskie, Pomorskie, Śląskie and Wielkopolskie). In 2023, the density of cycle paths in Kujawsko-Pomorskie, Śląskie and Wielkopolskie voivodeships increased by approximately 50%. In 2023, Małopolskie Voivodeship recorded the largest increase in the cycle path density and the percentage of road accidents where a bicycle was the vehicle of the party at fault. The cycle path density increased in 2023 across all voivodeships. Despite the increase in cycle path density, the percentage of road accidents where a bicycle was the vehicle of the party at fault increased in only seven voivodeships, most significantly by 1.2 percentage points in Lubuskie Voivodeship.

In Śląskie Voivodeship, in 2023, the density of cycle paths increased by almost 60%, which may have had a positive effect on the reduction (by 1.06 p.p.) in the percentage of road accidents where a bicycle was the vehicle of the party at fault. The largest increase in the percentage of road accidents under analysis, by 2.57 and 5.61 p.p., respectively, was noted in 2023 in Małopolskie and Podlaskie voivodeships. It is worth noting that in Małopolskie Voivodeship, the highest increase in cycle path density was observed in 2023 compared to 2018.

Table 1

The values of the variables under study in 2018 and 2023

Specification	2018		2023	
	X18	Y18	X23	Y23
Dolnośląskie	4.49	5.96	6.57	7.51
Kujawsko-Pomorskie	5.85	5.45	9.03	6.78
Lubelskie	3.03	7.80	4.89	8.07
Lubuskie	4.28	4.54	6.22	3.34
Łódzkie	4.22	5.75	6.52	5.40
Małopolskie	3.57	7.64	8.11	13.25
Mazowieckie	5.61	5.79	8.50	5.78
Opolskie	4.44	6.04	7.11	6.19
Podkarpackie	3.45	8.09	4.53	7.14
Podlaskie	2.86	3.80	4.37	6.37
Pomorskie	6.79	5.04	8.99	6.55
Śląskie	7.57	6.34	11.99	5.28
Świętokrzyskie	2.36	5.41	4.29	5.51
Warmińsko-Mazurskie	2.29	7.34	3.65	6.40
Wielkopolskie	6.12	6.72	9.45	6.23
Zachodniopomorskie	3.70	4.92	5.70	5.29

X18, X23 – density of cycle paths (expressed as km per 100 km^2)
Y18, Y23 – the percentage of road accidents where a bicycle is the vehicle of the party at fault (%)
Source: Local Data Bank (2025), GUS.

The numerical characteristics of the variables under analysis (Tab. 2) indicate that the average cycle path density in 2023 increased by approximately 2.5 km per 100 km² of the area. In 2023, the density of cycle paths exceeded 6.55 km per 100 km² in half of the voivodeships. Unfortunately, this did not contribute to a reduction in the percentage of road accidents where a bicycle was the vehicle of the party at fault. In this case, the mean value increased by approximately 0.53 p.p. in 2023. The distributions of the cycle path density and the percentage

Table 2

Statistical Indicators of Analysis

Specification	Average	Median	Minimum	Maximum	Standard deviation	Coefficient of variation	Skewness
X18	4.41	4.25	2.29	7.57	1.58	35.71	0.54
Y18	6.04	5.88	3.80	8.09	1.23	20.29	0.13
X23	6.87	6.55	3.65	11.99	2.32	33.82	0.54
Y23	6.57	6.30	3.34	13.25	2.09	31.77	2.19

Source: compiled using Statistica PL.

of road accidents under discussion in the particular years were characterised by right-sided asymmetry, although in the case of the distribution of variable Y18, it was very weak. It can be argued that in 2018 and 2023, most voivodeships showed below-average values of the features under study. Notably, in 2023, the percentage of road accidents in which a bicycle was the vehicle of the party at fault was recorded in 11 voivodeships. The direction and strength of asymmetry of the variables under study can be viewed in the histograms (Fig. 1 and 2).

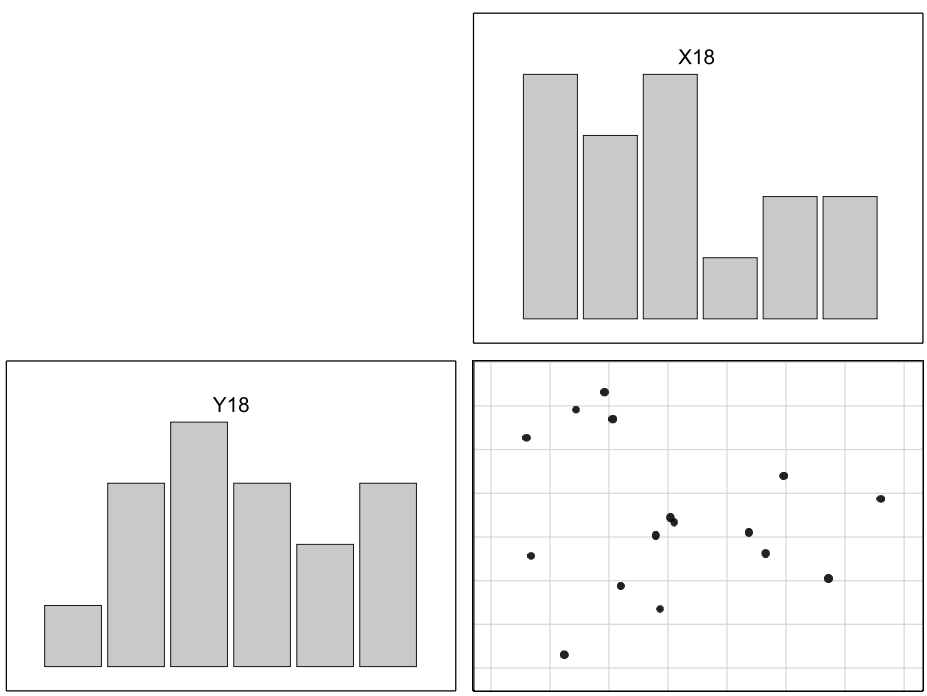

Fig. 1. Matrix figure for the variables in 2018

Source: compiled using Statistica PL.

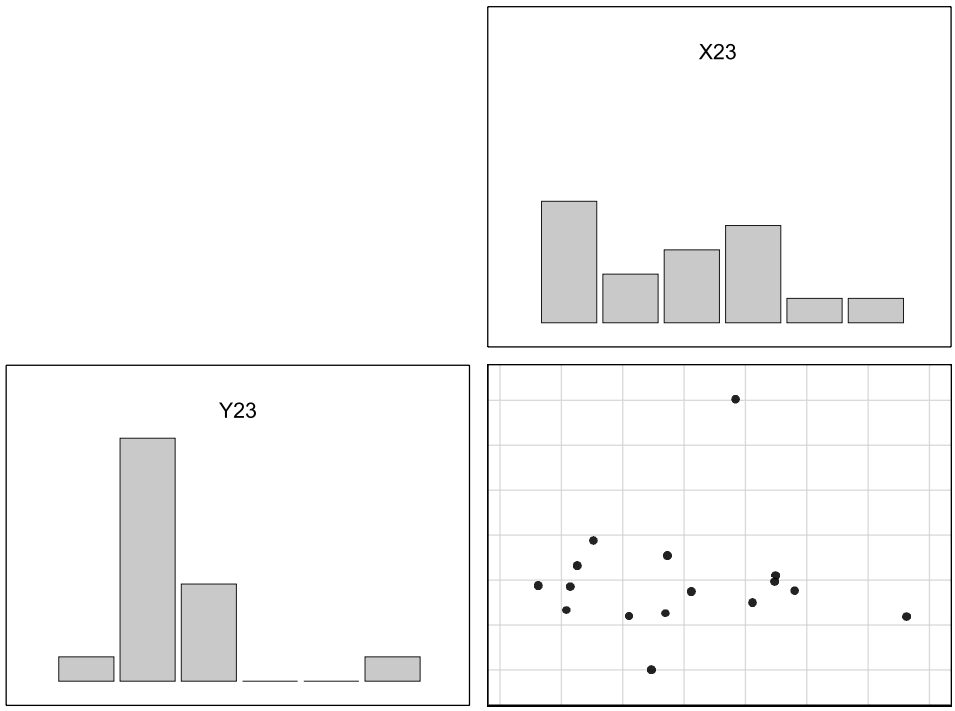

Fig. 2. Matrix figure for the variables in 2023
Source: compiled using Statistica PL.

The matrix figures (Fig. 1 and 2) enable the visualisation of the relationships between the variables. The value of Pearson's linear correlation coefficient between the variables for 2018 is –0.14, whereas for 2023 it is 0.04. The low values of these coefficients indicate a very weak relationship between the variables under study. The correlation figures show the occurrence of points that deviate significantly from the others (atypical) due to extreme values of the feature X or Y.

Liu's simplex depth measure values, provided in Table 3, allowed the voivodeships to be ordered in accordance with their distance from the centre of the two-dimensional samples. Each voivodeship was assigned a rank in accordance with its corresponding depth measure value. It can be noted that in the years concerned, the lowest depth measure values correspond to six and five voivodeships, respectively. In these voivodeships, the density of cycle paths or the percentage of road accidents where a bicycle was the vehicle of the party at fault achieve either low or high values. In 2018, Lubuskie Voivodeship ranked eighth in terms of the depth measure values, whereas in 2023, it is the most distant from the centre of the two-dimensional set due to the lowest percentage of road accidents under analysis. In the years under study, the highest value of Liu's simplex depth measure was observed for Opolskie Voivodeship,

indicating that it is most centrally situated in the two-dimensional data sets. The values of variables for this voivodeship are determined by two-dimensional median vectors of the [4.44; 6.04] and [7.11; 6.19] coordinates, respectively. It can be assumed that the cycle path density and the percentage of road accidents where a bicycle is the vehicle of the party at fault in Opolskie Voivodeship reach, in this case, the most typical values. In 2018, Podlaskie Voivodeship was situated at the outside of the data set due to the lowest percentage of road accidents under analysis.

The depth measure values enabled the production of numerical ranges that indicate which voivodeships correspond to specific depth measure values. In each year, the voivodeships were divided into four groups.

Table 3

Simplex depth measure values for variable data

Voivodeship	$Lzan_2$ (2018)	Range 2018	Voivodeship	$Lzan_2$ (2023)	Range 2023
Podkarpackie	0.188	3.5	Lubuskie	0.188	3
Podlaskie	0.188	3.5	Małopolskie	0.188	3
Pomorskie	0.188	3.5	Śląskie	0.188	3
Śląskie	0.188	3.5	Świętokrzyskie	0.188	3
Świętokrzyskie	0.188	3.5	Warmińsko-Mazurskie	0.188	3
Warmińsko-Mazurskie	0.188	3.5	Lubelskie	0.211	6
Lubelskie	0.211	7.5	Kujawsko-Pomorskie	0.230	7.5
Lubuskie	0.211	7.5	Podkarpackie	0.230	7.5
Wielkopolskie	0.246	9	Pomorskie	0.266	9
Małopolskie	0.273	10	Wielkopolskie	0.268	10.5
Zachodniopomorskie	0.295	11	Zachodniopomorskie	0.268	10.5
Kujawsko-Pomorskie	0.311	12	Podlaskie	0.275	12
Mazowieckie	0.341	13	Dolnośląskie	0.293	13.5
Łódzkie	0.404	14	Mazowieckie	0.293	13.5
Dolnośląskie	0.416	15	Łódzkie	0.295	15
Opolskie	0.418	16	Opolskie	0.425	16

Source: compiled using the mrfDepth package.

The first group includes voivodeships for which low or high values of the studied features were noted in the years under study. In 2018. Podlaskie Voivodeship showed the lowest percentage of road accidents (3.8%), whereas in 2023, this percentage increased by approximately 2.5 p.p. Śląskie, Świętokrzyskie and Warmińsko-Mazurskie voivodeships belong in each year to group 1 due to the

Table 4

Groups of voivodeships with individual depth measure values

Voivodeship group number	Interval of values for the depth measure	Voivodeships (year 2018)	Voivodeships (year 2023)
Group 1	<0; 0.211)	Podkarpackie, Podlaskie, Pomorskie, Śląskie, Świętokrzyskie, Warmińsko-Mazurskie	Lubuskie, Małopolskie, Śląskie, Świętokrzyskie, Warmińsko-Mazurskie
Group 2	<0.211; 0.266)	Lubelskie. Lubuskie. Wielkopolskie	Lubelskie. Kujawsko-Pomorskie. Podkarpackie
Group 3	<0.266; 0.295)	Małopolskie, Zachodniopomorskie, Kujawsko-Pomorskie	Pomorskie, Wielkopolskie, Zachodniopomorskie, Podlaskie, Dolnośląskie, Mazowieckie, Łódzkie
Group 4	<0.95; 0.425>	Mazowieckie, Łódzkie, Dolnośląskie, Opolskie	Opolskie

Source: compiled using the mrfDepth package.

very high cycle path density (Śląskie Voivodeship) and a very low value of this feature as compared to the other voivodeships (Świętokrzyskie and Warmińsko-Mazurskie) respectively.

The contours of depth shown in Figures 3 and 4 represent convex and ascending polygons. The shape of the internal contours of depth is more circular for the data in 2018. This indicates a lower concentration of the values of the analysed variables around the centre of the two-dimensional sample, as compared

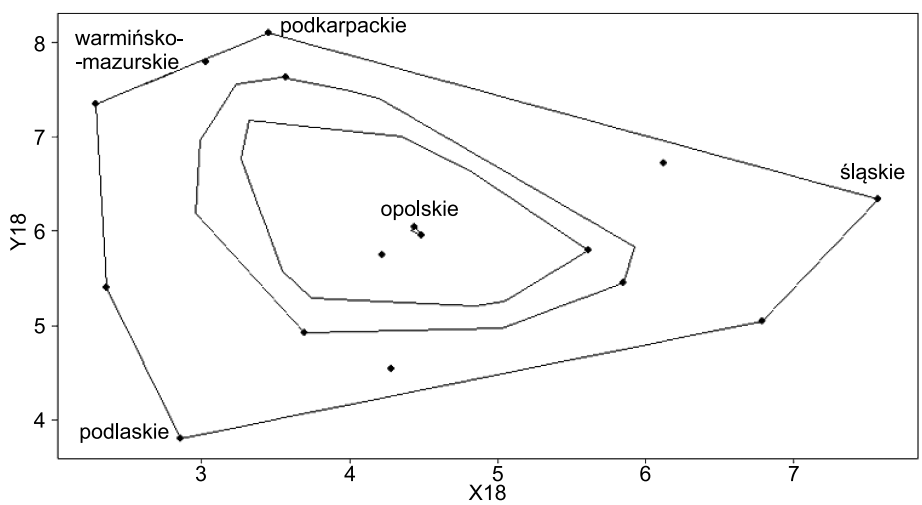

Fig 3. Depth contour figure for the data from 2018

Source: compiled using the "mrfDepth" package.

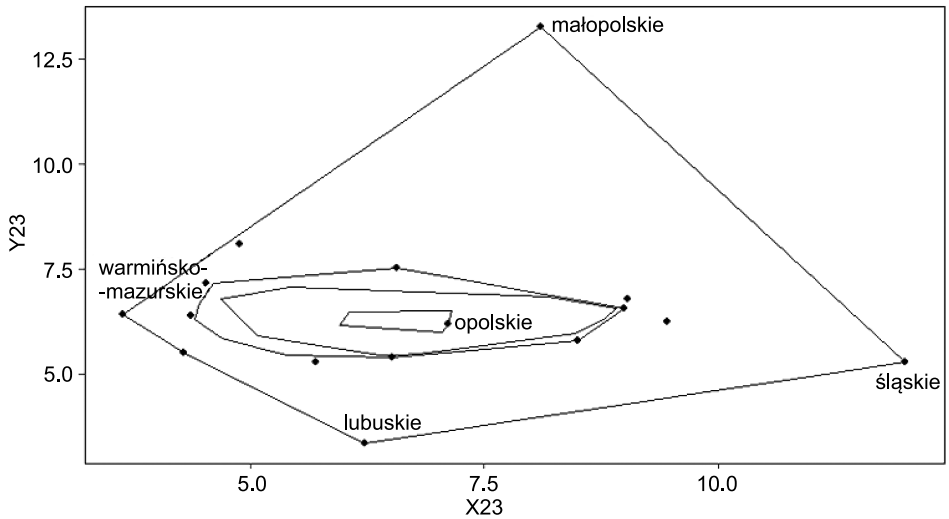

Fig. 4. Depth contour figure for the data from 2023
Source: compiled using the "mrfDepth" package.

to 2023. It is worth noting that Opolskie Voivodeship is situated centrally on the figures produced. In this voivodeship, the values for cycle path density and the percentage of road accidents in which a bicycle is the vehicle of the party at fault are the most typical. In Śląskie Voivodeship the percentage of road accidents in which a bicycle is the vehicle of the party at fault is similar to the values noted in Opolskie Voivodeship; however, the cycle path density is significantly higher, with almost 12 km per 100 km² in 2023. It can be noted that the shape of the convex hull (the outermost depth contour) is more "elongated" for the data from 2018, due to the high and low values of the features noted in this year in Śląskie and Warmińsko-Mazurskie voivodeships.

Summary and conclusions

Based on the analysis conducted. it can be concluded that:

– the voivodeships that showed a high density of cycle paths in the years under study included Pomorskie, Wielkopolskie and Śląskie,

– the highest percentages of road accidents where a bicycle was the vehicle of the party at fault were noted in Małopolskie and Podkarpackie voivodeships,

– the lowest density of cycle paths was observed in Podlaskie, Świętokrzyskie and Warmińsko-Mazurskie voivodeships,

– in 2018, in Podlaskie Voivodeship, the lowest percentage of road accidents where a bicycle was the vehicle of the party at fault was noted, whereas in 2023, this percentage increased in this voivodeship by approximately 2.5 p.p.,

– the most typical values of the analysed features in the years under study were noted in Opolskie Voivodeship,

– in Warmińsko-Mazurskie Voivodeship, the lowest cycle path density and a high percentage of road accidents where a bicycle was the vehicle of the party at fault were noted,

– Śląskie Voivodeship noted the highest density of cycle paths in the years under study, and in 2023, it ranked second in terms of the percentage of road accidents under analysis.

Data analysis methods based on observation depth measure in a sample can be used to:

– organise voivodeships according to their distance from the central sample concentration,

– identify the voivodeships that can be considered the most typical in terms of the diagnostic feature values,

– identify the voivodeships that showed very low or very high values of the diagnostic features under analysis,

– rank voivodeships according to the values of the diagnostic features under analysis,

– determine the concentration of the values of the variables under study in Let us assume that a two-dimensional set data sets.

It is noticeable that. in recent years. cycling has become increasingly popular as a means of transportation. This is a beneficial phenomenon. especially in terms of environmental protection and public health. It is worth noting that the density of cycle paths in Poland is increasing. To encourage Poles to cycle to work and on tourist trips. it is essential to increase the density of cycle paths and maintain cycling infrastructure in a technical condition that ensures its safe use.

Translated by Joanna Jensen

References

Dębowska-Mróz, M., Lis, P., Szymanek, A., & Zawisza, T. (2017). Rower miejski jako element systemu transportowego w miastach. *Autobusy: technika. eksploatacja. systemy transportowe*, *18*.

GUS. (2024). Podstawowe pojęcia. Droga dla rowerów. Retrieved from https://bdl.stat.gov.pl/bdl/metadane/metryka/3164 (6.08.2025).

GUS. (2022). Uczestnictwo w sporcie i rekreacji ruchowej w 2021 r. Retrieved from https://stat.gov.pl/obszary-tematyczne/kultura-turystyka-sport/sport/uczestnictwo-w-sporcie-i-rekreacji-ruchowej-w-2021-r-,5,2.html (6.08.2025).

Heilpern, S. (2005). Obserwacje nietypowe – przypadek wielowymiarowy. *Prace Naukowe Akademii Ekonomicznej we Wrocławiu,* 1097, 68-87.

Hyła, M. (2023). Polityka rowerowa polskich miast. *Badania Obserwatorium Polityki Miejskiej*, 1-77.

Liu, R. Y. (1990). On a Notion of Data Depth Based on Random Simplices. *The Annals of Statistics*, *18*, 405-414.

Liu, R. Y., Parelius, J. M., & Singh, K. (1990). Multivariate Analysis by Data Depth: Descriptive Statistics. Graphics and Inference. *The Annals of Statistics*, *27*, 783-858.

Local Data Bank. (2025). Retrieved from https://bdl.stat.gov.pl/bdl/dane/podgrup/temat. Dane z kategorii Transport i Łączność (5.03.2025).

Kosiorowski, D. (2012). Statystyczne funkcje głębi w odpornej analizie ekonomicznej. *Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie*, Kraków.

Maronna, R. A., Martin, R. D., Yohai, V. J., & Salibián-Barrera, M. (2019*). Robust statistics: theory and methods (with R)*, John Wiley & Sons.

Mosler, K. (2013). Depth statistics. Robustness and complex data structures: *Festschrift in Honour of Ursula Gather*, 17-34.

Mosler, K., & Mozharovskyi, P. (2022). Choosing among notions of multivariate depth statistics. *Statistical Science*, *37*(3), 348-368. https://doi.org/10.1214/21-STS827.

Pawełek, B., & Zeliaś, A. (1996). Metody wykrywania obserwacji nietypowych w badaniach ekonomicznych. *Zeszyty Naukowe/Akademia Ekonomiczna w Krakowie*, *475*, 5-27.

Ruts, I., & Rousseeuw, P. J. (1996). Computing Depth Contours of Bivariate Point Clouds. *Computational Statistics & Data Analysis*, *23*(1), 153-168.

Sommer, H., & Zakrzewski, G. (2021). Bezpieczeństwo na drogach rowerowych. *Studia Gdańskie. Wizje i rzeczywistość*, *17*, 311-331.

Struyf, A., & Rousseeuw, P. J. (2000). High-dimensional computation of the deepest location. *Computational Statistics & Data Analysis*, *34*(4), 415-426.

Tukey, J. W. (1975). Mathematics and Picturing Data. Proceedings of the 1974 international congress of mathematicians, Vol. 2., 523-531.

Wagner, W., & Kobylińska, M. (2002). Przegląd metod wyznaczania miar zanurzania w próbie dwuwymiarowej. *Przegląd Statystyczny*, *49*(4), 119-132.

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ORIGINAL PAPER

THE IMPACT OF THE RUSSIA-UKRAINE WAR ON THE RESILIENCE OF POLAND'S WHEAT SUPPLY CHAINS – AN ANALYSIS OF CHANGES IN THE CONFIGURATION OF POLAND'S EXPORT MARKET

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JEL Classification: Q13, Q17, L91, F14.

K e y w o r d s: wheat export, supply chain resilience, Russia-Ukraine war, export market reconfiguration, Poland.

A b s t r a c t

This article presents the results of a study on the macroeconomic aspects of the resilience of Poland's wheat export logistics system. The aim of the research is to identify changes in the configuration of Poland's wheat export markets in 2022–2023 in response to disruptions in international supply chains caused by the Russia-Ukraine war. The analysis focuses on the interaction and competition between the global wheat supply networks of Poland and Ukraine during the large-scale disruption of 2022–2023. The statistical analysis covers the period from 2012 to 2025. Qualitative methods – stratification and comparative analysis – confirmed the proposed hypotheses. The study reveals that Poland's wheat export network did not exploit Ukraine's weakened market position during the crisis, but instead expanded into regions where Ukraine had shown weak or no prior export interest. Overall, Poland's wheat export network maintained and strengthened its position in the European and African markets during the 2022–2023 crisis.

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WPŁYW WOJNY ROSYJSKO-UKRAIŃSKIEJ NA REZYLIENTNOŚĆ ŁAŃCUCHÓW DOSTAW PSZENICY POLSKI – ANALIZA ZMIAN W KONFIGURACJI POLSKIEGO RYNKU EKSPORTOWEGO

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Słowa kluczowe: eksport pszenicy, rezylientność łańcuchów dostaw, wojna rosyjsko-ukraińska, rekonfiguracja rynków eksportowych, Polska.

Abstrakt

Artykuł przedstawia wyniki badania makroekonomicznych aspektów rezylientności systemu logistycznego eksportu pszenicy z Polski. Celem badania jest identyfikacja zmian w konfiguracji rynków eksportowych polskiej pszenicy w latach 2022–2023 w odpowiedzi na zakłócenia w międzynarodowych łańcuchach dostaw spowodowane wojną rosyjsko-ukraińską. Analiza koncentruje się na interakcji i konkurencji między globalnymi sieciami dostaw pszenicy z Polski i Ukrainy w okresie zakłóceń na dużą skalę w latach 2022–2023. Analiza statystyczna obejmuje lata 2012–2025. Zastosowanie jakościowych metod badawczych, w szczególności stratyfikacji i analizy porównawczej, umożliwiło sformułowanie wniosków potwierdzających postawione hipotezy. Badanie pokazuje, że polska sieć eksportu pszenicy nie wykorzystała osłabionej pozycji rynkowej Ukrainy podczas kryzysu, lecz rozszerzyła się na regiony, w których Ukraina wcześniej wykazywała słabe lub zerowe zainteresowanie eksportowe. Ogólnie rzecz biorąc, polska sieć eksportowa pszenicy utrzymała i wzmocniła swoją pozycję na rynkach europejskich i afrykańskich w trakcie kryzysu lat 2022–2023.

Introduction

The Russian military invasion of Ukraine has caused large-scale disruptions in the global grain supply network, particularly in the wheat market. The rerouting of grain flows from Ukraine's southern seaports towards its western borders led to a sharp and significant surge in the logistical networks of European Union countries bordering Ukraine, especially Poland, during 2022–2023. This massive disruption in grain supply chains triggered a complex and contradictory response within Poland's logistics system: from negative reactions among hauliers and farmers to positive assessments from traders (Czubak *et al.*, 2024; *Zboże i rzepak z Ukrainy…*, 2023). Despite these challenges, Poland's logistical network demonstrated considerable resilience. However, the consequences of overcoming the 2022–2023 disruption remain under-researched. Existing studies on the logistics dimension of the situation have focused primarily on two areas: the potential for establishing and developing alternative grain supply routes from

Ukraine through Poland (Gołębiewski & Stefańczyk, 2023; Sadłowski & Zając, 2024), and the reasons for, as well as the economic rationale behind, domestic stakeholders' resistance to increased imports of Ukrainian grain (Czubak *et al.*, 2024; Dolińska, 2024; Pasztaleniec & Adamiak, 2024).

The choice of wheat exports as the object of study is explained by the strategic importance of this commodity for the Polish economy. In 2024, wheat accounted for 49% of the total volume of grain exports (*Rynek zbóż*, 2025). In the 2022/23 marketing year, wheat ranked second among grain exports from Ukraine to Poland (Tab. 1). "The impact of armed conflicts is significantly greater with regard to staple foods and products essential for food security (much greater in the case of wheat than of sugar)" (Zając & Bogusz, 2024).

Table 1

Grain exports from Ukraine to Poland, in thousand tonnes

Type of grain	2020/21 MY*	2021/22 MY	2022/23 MY
Corn	6.1	1466.2	1184.9
Wheat	3.9	15.9	875.8
Barley	0.0	12.2	50.8

* MY is October – September for corn, July – June for wheat and barley.
Source: own elaboration based on Sobolev (2023a, 2023b, 2024).

Supply chain resilience is defined as the ability "to withstand, adapt, and recover from disruptions to meet customer demand and ensure the target performance" (Aldrighetti *et al.*, 2023). Recovery following disruptions does not restore the supply chain to its previous state, as "the meaning of 'normal' [state] might constantly evolve and be adjusted both inside and outside the supply chain" (Richey *et al.*, 2022). In other words, certain changes are inevitable. Indicators of transformation may include changes in the elements of the supply chain: the structure of the supply network, the configuration of relationships, process and technology flows, and product architecture (Srai *et al.*, 2023). Our study focuses on structural changes in the wheat export supply network. Richey et al. argue that changes occurring under the influence of extreme events lack a stable foundation and do not become the future norm (or standard), whereas structural changes – those affecting the supply chain's configuration – require strategic planning and occur over the long term (Richey *et al.*, 2022). The period of sharply increased wheat inflows from Ukraine into Poland's supply channels lasted for approximately one year, until the official prohibition of wheat imports from Ukraine was imposed at the national level in Poland at the end of April 2023 (Rozporządzenie Ministra Rozwoju i Technologii z dnia 21 kwietnia 2023 r. w sprawie zakazu przywozu z Ukrainy produktów rolnych, 2023) and subsequently

at the EU[1] level on 2 May (Commission Implementing Regulation (EU) 2023/903 of 2 May 2023 introducing preventive measures concerning certain products originating in Ukraine, 2023; Commission Implementing Regulation (EU) 2023/1100 of 5 June 2023 introducing preventive measures concerning certain products originating in Ukraine, 2023). The duration of the system's response to disruption offers a window of opportunity for the implementation of long-term managerial decisions.

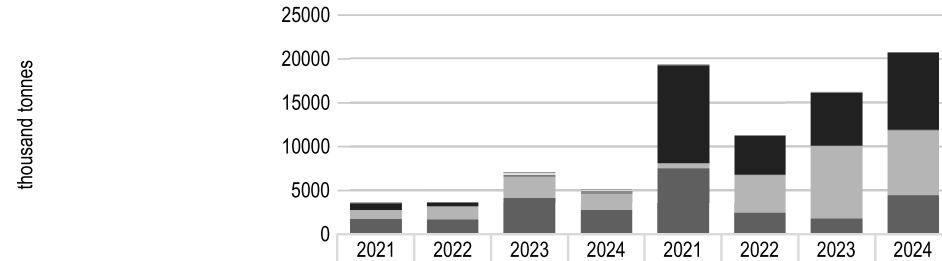
The study by Zając and Bogusz (2024) highlights Poland's entry into new wheat export markets during 2022–2023; however, the authors suggest that the achieved outcomes may be temporary. Therefore, the instances of wheat sales to new markets identified by A. Zając and M. Bogusz cannot be interpreted as a structural reconfiguration of export markets.

In the context of the logistical disruption and its resolution in 2022–2023, we observe the interaction between two major wheat supply logistics networks: the Polish and the Ukrainian. These networks share certain links within international wheat supply chains but also encompass many independent global wheat supply chains that compete with one another to some extent (Fig. 1). In 2022–2023, we note opposing trends in the volumes of wheat supplied to Africa and Asia, and similar trends in supplies to European countries (particularly EU member states) by both Poland and Ukraine. The overall volume of Ukrainian wheat exports is several times higher than that of Poland. Consequently, it is not possible to assess changes in the configuration of Poland's wheat export markets without accounting for Ukraine's export interests. It is also important to consider the gradual restoration of Ukraine's wheat export network, which has taken place since September 2022 with the partial resumption of maritime transport from Black Sea ports.

Figure 1 illustrates an increase in Poland's wheat exports during 2023–2024. It is important to note that this growth is attributed not only to the significant rise in wheat imports from Ukraine but also to increased wheat production in Poland during 2022–2023 (Tab. 2). Wheat production volumes have been gradually rising and consistently exceed import volumes each year, underscoring the critical role of domestic production in shaping the configuration of export markets. The growth in wheat production serves as a key driver for the expansion of export market structures.

It is also worth noting that domestic consumption levels and wheat stockpiles in 2022–2023 had little influence on export volumes.

[1] The ban on the import of wheat, as well as corn, rapeseed, and sunflower seeds from Ukraine to Poland, does not apply to their transit. The European Commission regulations expired on 15 September 2023. In order to extend the ban on the import of wheat and certain other goods from Ukraine, Rozporządzenie Ministra Rozwoju i Technologii z dnia 15 września 2023 r. w sprawie zakazu przywozu z Ukrainy produktów rolnych (Dz. U. z 2023, poz. 1898) was adopted.



	Poland				Ukraine			
Countries not specified within the framework of extra-Union trade	0.0	0.9	9.6	3.9	0.0	0.0	0.0	0.00
Latin America and the Caribbean	8.1	13.2	12.1	0.0	156.9	0.3	0.0	0.00
Northen America	7.6	0.0	318.4	115.8	0.0	9.3	14.7	0.03
Asia	705.4	342.6	62.7	0.0	11110.1	4389.6	6003.6	8770.4
Other European countries	70.6	34.4	120.8	326.8	57.6	87.8	104.0	105.7
EU countries	1037.7	1547.4	2242.6	1776.6	536.4	4255.3	8236.6	7349.3
Africa	1765.6	1699.4	4206.3	2820.1	7533.9	2480.9	1792.7	4439.3

Fig. 1. Total wheat and meslin export of Poland and Ukraine in 2021-2024 by world regions, in thousand tonnes

Source: own elaboration based on Eurostat database.

Table 2

Selected elements of annual wheat balances of Poland, in thousand tonnes

Wheat balance elements	2017	2018	2019	2020	2021	2022	2023
Opening stock	6 846	8 292	7 091	6 708	4 783	3 890	5 531
Usable production	11 666	9 820	11 012	12 669	12 119	13 445	13 178
Domestic consumption	8 480	9 707	9 813	10 633	9 051	9 151	8 161

Source: own elaboration based on Eurostat database.

The study's objective is to pinpoint shifts in the structure of Polish wheat export markets in 2022–2023, as a consequence of the Russian-Ukrainian war leading to disruption in global supply chains. The research questions are to investigate how Poland's wheat export logistics system has used its potential to increase flows during the period of large-scale disruption in the logistics network and whether it has gone beyond its current configuration in terms of wheat export markets.

Poland and Ukraine share overlapping wheat export markets; therefore, expansion into regions where Ukraine has shown limited export activity appears more attainable for Poland. The stability of the achieved results of the reconfiguration of Poland's wheat export areas in 2022–2023 would be evidenced by the continuation of exports to these markets in 2024 and 2025. It is expected that in sustainable complex supply networks, cooperation will increasingly outweigh

competition, advancing economic, environmental, and social goals (Pathak *et al.*, 2014). We formulate the following interrelated hypotheses:

H1. The expansion of Poland's wheat export market configuration in 2022–2023 took place in regions that had shown the lowest levels of Ukraine's wheat export interest prior to Russia's invasion of Ukraine in 2022.

H2. The expansion of Poland's wheat export market configuration in 2022–2023 did not occur at the expense of Ukraine's export markets.

Research methodology

The research questions were formulated on the basis of a literature review. The study was conducted using statistical data and qualitative analytical methods, in particular stratification and the method of comparison. The issue under investigation concerns the impact of the situation in Ukraine on developments in Poland within the shared branches of the global wheat supply network. Therefore, to analyse Poland's export flows, a comparative approach using Ukrainian data was applied. It was found that the export and import statistics for Ukrainian wheat differ in volume between the Eurostat and State Customs Service of Ukraine databases. As a result, only Eurostat data were used for the analysis of wheat exports and imports from both Poland and Ukraine. The only exception concerns Ukrainian wheat exports in 2015 and 2016, where data from the State Statistics Service of Ukraine were used due to the absence of corresponding entries in the Eurostat database.

Wheat classification follows Harmonized System (HS) codes, while the classification of geographical regions is based on the United Nations "Standard Country or Area Codes for Statistical Use (M49)".

To assess the novelty of Poland's wheat export destinations, overlapping zones with Ukraine's export markets were analysed for the decade preceding the Russia-Ukraine war (2012–2021) – a sufficiently long period to establish market patterns. The analysis was limited to export directions where Poland was active in 2022–2023, as only these routes were subject to potential reconfiguration.

Based on this data, six clusters of Poland's wheat export markets were identified (Tab. 3), grouped by the intensity of exporter activity. To measure this, the indicator "Number of non-export years during 2012–2022" was applied.

Table 3

Groups and stratification criterion of selected areas of wheat export interests of Poland and Ukraine in 2012–2021

Groups of wheat export markets	Number of non-export years during 2012–2022	Countries
Group 1 – Area (markets) of intersection of wheat export interests of Poland and Ukraine	0 – 4 years for Poland and Ukraine	*Africa*: Algeria, Kenya, Morocco, Tanzania, South Africa, Mozambique, Nigeria. *EU countries*: Austria, Italy, France, Germany, Lithuania, Netherlands, Spain. *Other European countries*: Belarus, United Kingdom.
Group 2 – Area (markets) of sporadic wheat export interests of Poland and Ukraine	5 – 10 years for Poland and Ukraine	*Africa*: Burundi, Congo (Democratic Republic of), Congo, Ghana, Gambia, Guinea, Malawi, Namibia, Rwanda, Senegal, Zimbabwe. *EU countries*: Bulgaria, Estonia, Hungary. *Asia*: Kazakhstan.
Group 3 – Area (markets) of wheat export interests of Poland (outside the wheat export interests of Ukraine)	0 – 9 years for Poland 10 years for Ukraine	*EU countries*: Luxemburg, Belgium, Finland, Latvia, Sweden, Slovakia. *Other European countries*: Iceland. *Latin America and the Caribbean*: Haiti. *Countries and territories not specified within the framework of extra-Union trade.*
Group 4 – Area (markets) of unequal wheat export interests of Poland and Ukraine	x	x
Subgroup 4A – Area (markets) of predominant wheat export interests of Poland	0 – 4 years for Poland 5 – 9 years for Ukraine	*EU countries*: Czechia, Denmark, Ireland, Portugal, Romania, Slovenia. *Other European countries*: Norway, RF (Russia). *Asia*: Saudi Arabia. *North America*: Canada, USA.
Subgroup 4B – Area (markets) of predominant wheat export interests of Ukraine	5 – 9 years for Poland 0 – 4 years for Ukraine	*Africa*: Mauritania. *EU country*: Greece. *Other European countries*: Moldova, Switzerland. *Asia*: Israel.
Group 5 – Area (markets) outside the wheat export interests of Poland	x	x
Group 5A – Area (markets) outside the wheat export interests of Poland and inside the wheat export interests of Ukraine	10 years for Poland 0 – 9 years for Ukraine	*Africa*: Angola, Burkina Faso, Benin, Côte d'Ivoire (Ivory Coast), Cameroon, Madagascar, Mali, Gabon.
Group 5B – Area (markets) outside the wheat export interests of Poland and Ukraine	10 years for Poland and Ukraine	*Africa*: Cabo Verde, Liberia, Togo.

Source: own elaboration.

Research results

Stratification made it possible to distinguish between those zones within Poland's wheat export configuration that were part of the established market structure prior to the 2022–2023 crisis (groups 1–4), and those that entered Poland's wheat export configuration during 2022–2023 (group 5). The market groups that were already part of Poland's wheat export zones before the 2022–2023 crisis could only undergo configuration changes in the direction of contraction during the period of crisis resolution and recovery (2022–2025). The total volumes of Poland's wheat exports by market group are presented in Table 4.

Table 4

Wheat export from Poland to selected areas (markets) in 2012–2025, in thousand tonnes

Group number*	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Jan–May 2025
1	779	1155	2005	2168	2242	1745	800	900	2437	2716	2446	4963	3007	576
2	1	9	67	36	69	91	48	22	42	10	170	439	661	355
3	20	8	19	21	53	58	6	19	29	14	79	78	126	28
4.A	258	353	934	648	1459	506	840	773	1805	855	266	540	309	48
4.B	0.01	0.03	0	86	5	33	13	41	31	0	272	89	60	0
5.A	0	0	0	0	0	0	0	0	0	0	354	781	759	288
5.B	0	0	0	0	0	0	0	0	0	0	52	82	122	27

*Group and subgroup numbers are given according to the data in Table 3.
Source: own elaboration based on Eurostat database.

Groups 1, 2, and 5B are characterised by balanced export interest of varying intensity from both Poland and Ukraine: regular interest (group 1), irregular interest (group 2), and zero interest (group 5B). In addition, groups 1 and 2 are the most numerous, comprising 16 and 15 countries respectively.

Group 1 shows the highest Poland-Ukraine competition. Although Poland increased wheat exports to this zone in 2022–2023, its overall configuration contracted. It failed to capitalise on its positions in Algeria and Kenya (Tab. 5), while a rise in exports to the UK did not alter the zonal configuration.

Poland effectively leveraged its potential and strengthened its position in wheat supply chains, particularly in deliveries to Africa, within groups 2 and 5B, where competition with Ukraine prior to 2022 had been relatively low or entirely absent. In 2024, wheat exports from Poland to African markets within group 2 amounted to 655 thousand tonnes, and in January–May 2025 totalled 355 thousand tonnes – 65.5 and 35.5 times higher, respectively, than exports to this region in 2021. In 2025, Poland also continued to export wheat

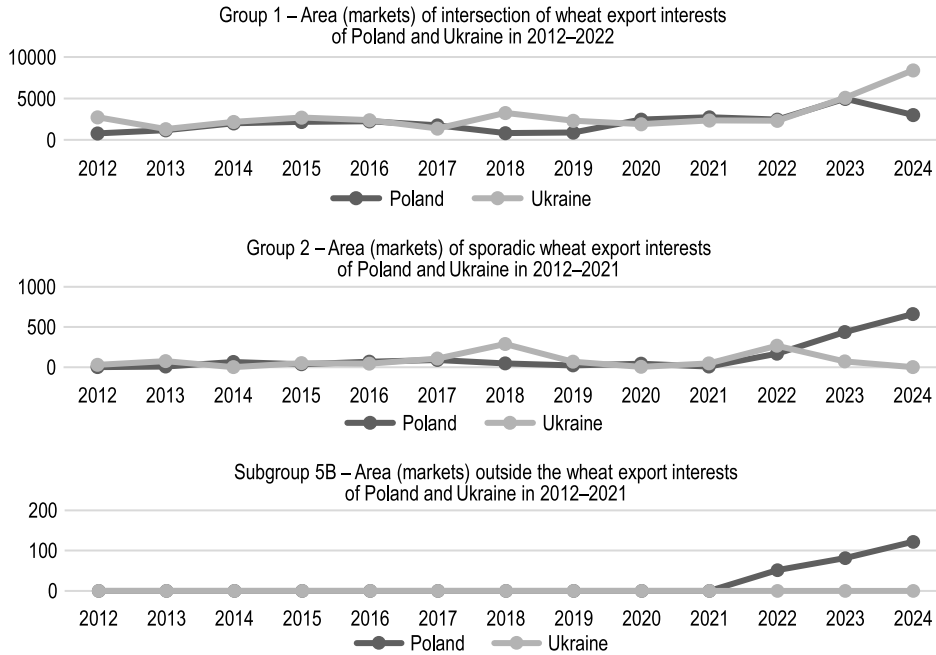


Fig. 2. Wheat export from Poland and Ukraine to countries of group 1, 2, and 5B in 2012–2024, in thousand tonnes

Source: own elaboration based on Eurostat database and State Customs Service of Ukraine (for 2015 and 2016).

Table 5

Wheat export from Poland and Ukraine to Algeria and Kenya (group 1) in 2022–2025, in thousand tonnes

Exporters	Importers	2022	2023	2024	Jan–May 2025
Poland	Algeria	0	32	0	0
	Kenya	105	0	0	0
	United Kingdom	6	64	234	0.1
Ukraine	Algeria	488	32	1349	844
	Kenya	78	156	0	0
	United Kingdom	4	11	71	0

Source: own elaboration based on Eurostat database.

to Kazakhstan (group 2) as well as to Liberia and Togo (group 5B). Consequently, the inclusion of Liberia and Togo expanded the configuration of Poland's wheat export markets.

Groups 3, 4, and 5A are characterised by asymmetrical export interest between Poland and Ukraine. Groups 3 and 4A are dominated by Poland's

export interests (Fig. 3), whereas groups 4B and 5A are primarily shaped by Ukraine's export focus (Fig. 4).

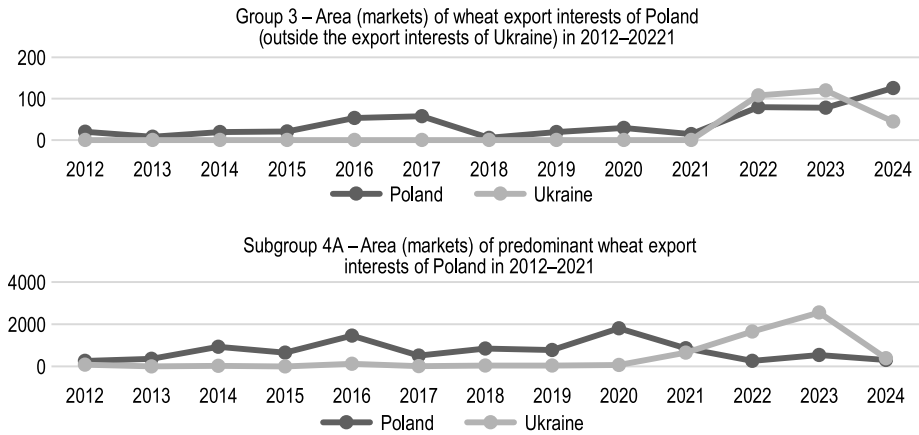
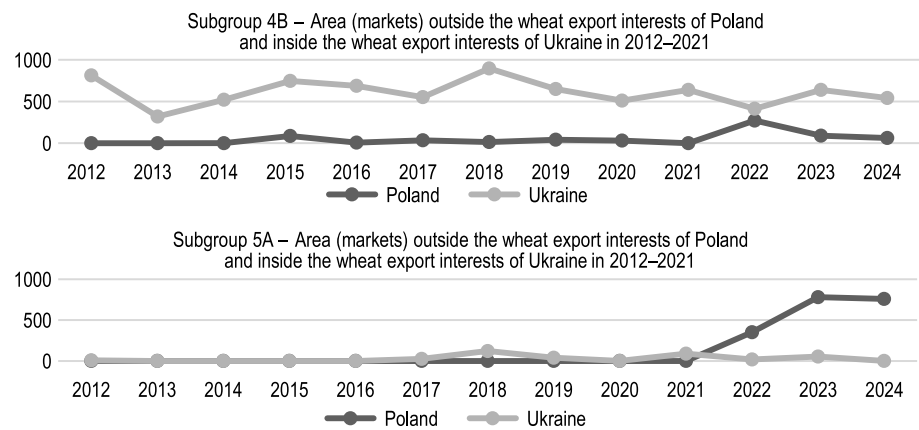


Fig. 3. Wheat export from Poland and Ukraine to countries of group 3 and 4A in 2012–2024, in thousand tonnes

Source: own elaboration based on Eurostat database and State Customs Service of Ukraine (for 2015 and 2016).



In group 4B, where Poland holds weaker positions than Ukraine, exports rose in 2022–2023 due to shipments to Mauritania and Israel but ceased entirely by 2025.

Fig. 4. Wheat export from Poland and Ukraine to countries of group 4B and 5A in 2012–2024, in thousand tonnes

Source: own elaboration based on Eurostat database and State Customs Service of Ukraine (for 2015 and 2016).

Poland successfully utilised and consolidated its position in the markets of group 3, where the majority of exports are directed towards EU countries and Iceland. As of 2025, the main area of competition between Poland and Ukraine in wheat supply is the Belgian market. However, in January–May

2025, Poland's wheat export volume to group 3 markets significantly exceeded that of Ukraine – 28.3 thousand tonnes compared to just 0.3 thousand tonnes, respectively.

Changes in the configuration of Poland's wheat export markets are occurring as a result of logistical shifts in the Asian direction, influenced by the geopolitical factors of the Russia-Ukraine war. During the period 2022–2025, wheat deliveries to Saudi Arabia (group 4A) fell to zero (Tab. 6).

Table 6

Wheat export from Poland to countries of subgroup 4A in 2021–2025, in thousand tonnes

Importers	2021	2022	2023	2024	Jan–May 2025
EU*+Norway	140.77	151.33	158.91	192.73	47.56
North America	7.55	0.00	318.35	115.77	0.0004
Saudi Arabia	705.30	114.77	62.70	0.00	0.00
Russia	0.88	0.02	0.04	0.00	0.28

*EU countries in subgroup 4A: Czechia, Denmark, Ireland, Portugal, Romania, Slovenia.
Source: own elaboration based on Eurostat database.

Saudi Arabia was Poland's key Asian wheat importer during 2011–2021. Its share of Poland's total wheat exports to Asian countries ranged from 81% (in 2013) to 100% (in 2011, 2012, 2018, and 2021), and from 7% (in 2011) to 39% (in 2018) of Poland's total wheat exports. In addition to the decline in wheat exports to Asia, the volume of wheat exports from Poland to Russia also decreased during 2022–2025, though it did not come to a complete halt.

In 2022–2023, Poland made very effective use of Ukraine's limited activity in the markets of group 5A. In January–May 2025, wheat exports from Poland to countries in this group – namely Angola, Burkina Faso, Benin, Cameroon, and Gabon – amounted to 288.2 thousand tonnes, indicating the consolidation of Poland's position in these new markets. There is further potential for continued shipments to other countries within group 5A, including Côte d'Ivoire, Madagascar, and Mali.

Conclusions

The study confirmed that in 2022–2023, Poland's wheat export markets underwent notable reconfiguration due to disruptions caused by the Russia--Ukraine war. These changes included both losses and gains, demonstrating the resilience of Poland's wheat supply system.

The most significant loss was the cessation of exports to Saudi Arabia, previously Poland's key market in Asia. Poland failed to maintain its position

in Algeria and Kenya – markets characterised by high competition with Ukraine. It also did not strengthen its role in regions where Ukraine had a dominant presence. By 2025, Poland's presence there remained marginal.

Despite geopolitical tensions, Russia and Belarus remained among Poland's export destinations. However, the largest expansion was observed in African markets, which have historically been less attractive to Ukraine. Poland's expansion into new destinations during the peak crisis period confirmed the first hypothesis about entering regions where competition with Ukraine was relatively low or completely absent until 2022.

While Poland entered numerous new markets, long-term consolidation occurred only in a few – such as Angola, Burkina Faso, Benin, Cameroon, Gabon, Liberia, and Togo. This supports the second hypothesis: the expansion followed a complementary, not substitutional, trajectory relative to Ukraine's export activity.

Changes in export geography were structural, not just quantitative: with the loss of some markets, the gain of others, and redefined trade volumes. A marked shift occurred from Asia to Africa, influenced by geopolitical and logistical factors.

These findings provide a basis for future studies on the relationship between market reconfiguration and the operational logistics of Poland's wheat exports, particularly regarding infrastructure and long-term route viability.

Translated by the Author

References

Aldrighetti, R., Battini, D., & Ivanov, D. (2023). Efficient resilience portfolio design in the supply chain with consideration of preparedness and recovery investments. *Omega*, *117*, 102841. https://doi.org/10.1016/j.omega.2023.102841.

Commission Implementing Regulation (EU) 2023/903 of 2 May 2023 introducing preventive measures concerning certain products originating in Ukraine. Official Journal of EU LI 114/1 from 2.05.2023.

Commission Implementing Regulation (EU) 2023/1100 of 5 June 2023 introducing preventive measures concerning certain products originating in Ukraine. Official Journal of EU LI 144/1 from 5.06.2023.

Czubak, W., Kalinowski, S., & Pepliński, B. (2024). *Ziarno niezgody: analiza protestów rolniczych*. Instytut Finansów Publicznych. https://www.ifp.org.pl/ziarno-niezgody-analiza-protestow-rolniczych/

Dolińska, A. (2024). Protesty rolników a import z Ukrainy. Fakty, mity, dezinformacja. *Analizy&Opinie. Instytut Spraw Publicznych*, *12*(163), 1-16. Retrieved from https://www.isp.org.pl/uploads/drive/aio/ao_12b.pdf (3.05.2025).

Eurostat database. International trade of EU and non-EU countries since 2002 by HS2-4-6. Eurostat. https://ec.europa.eu/eurostat/databrowser/view/ds-059341/legacyMultiFreq/table?lang=en&category=ext_go.ext_go_detail

Foreign trade in individual types of goods by country of the world. State Statistics Service of Ukraine. https://www.ukrstat.gov.ua

Gołębiewski, J., & Stefańczyk, J. (2023). Czynniki i kierunki zmian na rynku zbóż w Polsce w warunkach wojny w Ukrainie. *Annals of the Polish Association of Agricultural and Agribusiness*

Economists/ Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu, *XXV*(4), 60-75. https://doi.org/10.5604/01.3001.0054.0103.

Pasztaleniec, J., & Adamiak, M. (2024). Import oraz obrót zbożem i rzepakiem z Ukrainy. *Kontrola Państwowa*, *2*, 56-67. https://doi.org/10.53122/ISSN.0452-5027/2024.1.12.

Pathak, S., Wu, Z., & Johnston, D. (2014). Toward a structural view of co-opetition in supply networks *Journal of Operations Management*, *32*(5), 254-267. https://doi.org/10.1016/j.jom.2014.04.001.

Richey, R.G., Roath, A.S., Adams, F.G., & Wieland, A. (2022). A Responsiveness View of logistics and supply chain management. *Journal of Business Logistics*, *43*(1), 62-91. https://doi.org/10.1111/jbl.12290.

Rozporządzenie Ministra Rozwoju i Technologii z dnia 15 września 2023 r. w sprawie zakazu przywozu z Ukrainy produktów rolnych. Dz. U. z 2023, poz. 1898.

Rozporządzenie Ministra Rozwoju i Technologii z dnia 21 kwietnia 2023 r. w sprawie zakazu przywozu z Ukrainy produktów rolnych. Dz. U. z 2023, poz. 751.

Rynek zbóż (2025). Biuro Analiz i Strategii Krajowego Ośrodka Wsparcia Rolnictwa. *6*. https://www.gov.pl

Sadłowski, A., & Zając, A. (2024). Export of Ukrainian agricultural products through Poland – route restrictions. *Agricultural and Resource Economics*, *10*(4), 29-46. https://doi.org/10.51599/are.2024.10.04.02.

Sobolev, D. (2023a). *Report: Grain and Feed Annual* (UP2023-0012). USDA. Retrieved from https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Grain%20and%20Feed%20Annual_Kyiv_Ukraine_UP2023-0012.pdf (16.09.2024).

Sobolev, D. (2023b). *Report: Grain and Feed Quarterly* (UP2023-0040). USDA. Retrieved from https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Grain%20and%20Feed%20Quarterly_Kyiv_Ukraine_UP2023-0040.pdf (24.09.2024).

Sobolev, D. (2024). *Report: Grain and Feed Annual* (UP2024-0008). USDA. Retrieved from https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Grain%20and%20Feed%20Annual_Kyiv_Ukraine_UP2024-0008.pdf (24.09.2024).

Srai, J.S., Graham, G., Van Hoek, R., Joglekar, N., & Lorentz, H. (2023). Impact pathways: unhooking supply chains from conflict zones – reconfiguration and fragmentation lessons from the Ukraine-Russia war. *International Journal of Operations & Production Management*, *43*(13), 289-301. https://doi.org/10.1108/IJOPM-08-2022-0529.

Zając, A., & Bogusz, M. (2024). Wpływ wojny na Ukrainie na sytuację ekonomiczno-finansową wybranych branż polskiego sektora rolno-spożywczego. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie. Problemy Rolnictwa Światowego*, *24(XXXIX)*(4), 42-57. https://doi.org/10.22630/PRS.2024.24.4.15.

Zboże i rzepak z Ukrainy – kto na tym zarobił, a kto stracił (zapis konferencji prasowej). (2023). Najwyższa Izba Kontroli. Retrieved from https://www.nik.gov.pl/aktualnosci/import-zboza-z-ukrainy.html (18.05.2025).

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ORIGINAL PAPER

MACROECONOMIC ASSESSMENT OF THE STRUCTURE OF INCOME AND EXPENDITURES OF THE HOUSEHOLD SECTOR OF UKRAINE IN 2021–2024

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JEL Classification: D14, D31, E21, G51.

K e y w o r d s: household income, household expenditure, economic inequality, poverty, macroeconomic assessment.

A b s t r a c t

The article examines the macroeconomic assessment and structure of household income and expenditure in Ukraine in 2021–2024 using a developed system of universal indicators (income, expenditure, poverty, inequality, financial stability). This approach enabled analysis under conditions of limited access to sample surveys. Significant negative consequences of the full-scale Russian

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invasion of Ukraine were identified: despite nominal growth, real disposable incomes fell sharply in 2022 and only partially recovered. A forced concentration of expenditure on basic needs was observed, as evidenced by an increase in the Engel coefficient to 54.5% in 2024. A large-scale deepening of poverty (with the risk of poverty doubling) and inequality (the Gini coefficient increased from 0.257 to 0.465) was identified, disproportionately affecting the least well-off. The undermining of financial sustainability is confirmed (negative savings rate in 2022). The results justify the need to revise welfare criteria and differentiate the application of social assistance for vulnerable groups of the population (IDPs, large families, rural residents).

OCENA MAKROEKONOMICZNA STRUKTURY DOCHODÓW I WYDATKÓW SEKTORA GOSPODARSTW DOMOWYCH W UKRAINIE W LATACH 2021–2024

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Kody JEL: D14, D31, E21, G51.

Słowa kluczowe: dochody gospodarstw domowych, wydatki gospodarstw domowych, nierówności ekonomiczne, ubóstwo, ocena makroekonomiczna.

Abstrakt

W artykule przeanalizowano strukturę dochodów i wydatków gospodarstw domowych w Ukrainie w latach 2021–2024, wykorzystując opracowany system uniwersalnych wskaźników obejmujących dochody, wydatki, ubóstwo, nierówności oraz stabilność finansową. Zastosowanie tego podejścia umożliwiło przeprowadzenie analizy w warunkach ograniczonego dostępu do danych z badań reprezentatywnych. Uzyskane wyniki badań wskazują na istotne negatywne konsekwencje makroekonomiczne pełnoskalowej inwazji Rosji na Ukrainę. Pomimo nominalnego wzrostu dochodów, realne dochody rozporządzalne gwałtownie spadły w 2022 roku i jedynie częściowo uległy odbudowie w kolejnych latach. Zaobserwowano również wymuszoną koncentrację wydatków na dobra podstawowe, czego wyrazem był wzrost współczynnika Engla do 54,5% w 2024 roku. Ponadto wykazano, że utrwaliło się zjawisko szeroko zakrojonego ubóstwa (zagrożenie ubóstwem wzrosło dwukrotnie) oraz pogłębiły się nierówności dochodowe (współczynnik Giniego zwiększył się z 0,257 do 0,465), co w szczególnie niekorzystny sposób dotknęło gospodarstwa domowe o najniższych dochodach. Odnotowano również osłabienie stabilności finansowej, czego przejawem była ujemna

stopa oszczędności w 2022 roku. Uzyskane wyniki wskazują na potrzebę rewizji kryteriów oceny dobrobytu oraz zróżnicowania zasad udzielania pomocy społecznej, zwłaszcza wobec grup szczególnie wrażliwych, takich jak osoby wewnętrznie przesiedlone, rodziny wielodzietne oraz mieszkańcy obszarów wiejskich.

Introduction

The assessment of the financial situation (main indicators groups: "Income", "Expenditure" and derived indicators groups: "Poverty", "Inequality", "Financial Stability") of households is traditionally based on anonymous sample surveys that ensure the representativeness of all income groups. However, since 2022 in Ukraine, due to economic and political constraints caused by the full-scale invasion, the main source of these data – the household living conditions survey – has become unavailable (Deaton, 1997, p. 23; Mjeda *et al.*, 2021, p. 1084). Under these circumstances, there is an urgent need to develop a methodology for assessing household income and expenditure at the macroeconomic level, which will save time and resources, while providing a sufficient level of assessment of their financial situation (Wilde, 2000, p. 780; Hoddinott & Quisumbing, 2010, p. 76; Grzywińska-Rąpca, 2021, p. 951). The key methodological challenge is to ensure the universality and comparability of the selected indicator system in dynamics and space, which is necessary for the integration of the national study into the global scientific context. Accordingly, the study aims to develop and apply a system of indicators that cover income, expenditure, poverty, inequality and financial sustainability, based on public and accessible data (Cantarella, 2021, p. 3).

Analysis of recent research indicates the deep attention of scientists and international organizations to the financial condition of Ukrainian households in wartime. In particular, Shyshkin (2024, p. 3-4) and Zavadsky (2024, p. 94-96). devoted their works to the study of changes in the level and structure of household incomes and their general socio-economic condition under the influence of a full-scale war. Methodological principles of analysis of expenses and factors of consumer behavior in the pre-war and war periods are disclosed in the works of Pashchenko & Zharikova (2023, p. 36-43) and Kotenko & Korotkova (2023, p. 6-8). Critical aspects of the growth of economic inequality and material deprivation as a result of the crisis and war were analyzed by Zavhorodnia (2024, p. 5-7) and Kogatko & Polyakova (2024, p. 4-5). At the same time, Laska (2024, p. 96-97) investigated the differentiation of income depending on the size of the household. Despite the significant number of studies of individual aspects, there is a need for generalization and macroeconomic assessment of these processes according to a single system of universal and comparative indicators.

Methodological assumptions

Usually, the assessment of the financial condition of households is carried out on the basis of anonymous sample surveys with the condition of representativeness of all different groups by income level. At the same time, circumstances arise in which this type of data becomes impossible to collect or the survey is not carried out due to restrictions (economic, political and other) – for example, the anonymous survey of household living conditions has been the main source of information in Ukraine on household income and expenses since 1999, but since 2022 such data have been unavailable. Therefore, in such circumstances, it is necessary to develop a methodology and conduct an assessment of household income and expenses at the macroeconomic level, which will require the involvement of fewer resources and time in combination with providing a sufficient level of assessment of the financial condition of households.

When developing a system of indicators to assess the financial situation of households, a key methodological challenge is to ensure the universality and comparability of these indicators. It is not enough to simply collect data, it is also necessary to ensure that these data can be correctly compared both in dynamics (comparison of different periods within the same country) and in space (comparison between different countries or regions). It is this approach that allows us to go beyond local analysis and integrate national research into a global scientific context and identify common challenges.

To account for significant demographic shifts and displacement during the war, population estimates for per capita calculations were derived using a multi-sourced triangulation approach. This included operational data from the State Statistics Service of Ukraine, official IDP figures from the Ministry of Social Policy, and external migration statistics from UNHCR and IOM. Given the inherent data limitations and high uncertainty of wartime demographics, the study relies on a comparative analysis of structural dynamics and ratios rather than formal causal econometric modeling. This approach minimizes the impact of absolute population fluctuations and ensures more robust conclusions regarding changes in household well-being.

In accordance with the objectives of the study, the optimal option for assessing the financial condition of households is the system of indicators shown in Table 1.

In Table 1, we see the distribution of indicators into four categories – "Income", "Expenditure", "Poverty", "Inequality" and "Financial Sustainability" – such a clear division will also allow us to compare individual regions and countries in terms of the state of households as a whole and by individual categories. The advantage of the indicators listed in the table is also that they are simple and are mainly published by national statistical services and widely studied in scientific and journalistic circles.

For this study, inflation adjustments were derived from an averaged assessment based on multiple authoritative sources to ensure an objective

Table 1

A system of indicators for comparative assessment of household conditions

Category	Indicator	Purpose and calculation
Income	Median disposable income (in average per capita)	An estimate of the central tendency of income distribution, reflecting the level of well-being of a typical individual. The income of a person who is in the center of a ranked series of the distribution of equivalent incomes of the population
	Real disposable income (in average per capita)	Measuring changes in the purchasing power of the population using nominal incomes adjusted for inflation („year-on-year")
	Concentration of income by source (in average per capita)	Assessment of the relative importance of income sources and dependence on a specific source. Higher value of this indicator implies lower concentration around a single source
Expenditure	Actual cost level (in average per capita)	Characteristics of the achieved level of welfare through the volume of final consumption. The cost of goods and services consumed during the reporting period
	Engel coefficient (in average per capita)	Inverse dependence of the share of food expenditures on income level. Ratio of food expenditures to total consumer expenditures
	Concentration of consumer spending (in average per capita)	Specific weight of expense groups in total consumption. Calculation of absolute indicator for all groups (higher value – lower concentration)
Poverty	Poverty risk level	Estimate of relative poverty in society. The share of people whose equivalized income is below 60% of the national median
	Absolute poverty level	Measuring the proportion of the population unable to meet minimum needs. The proportion of people whose income/expenditures are below the established poverty line (subsistence minimum)
	Level of social deprivation	Poverty assessment due to forced deprivation of generally accepted benefits. The proportion of people with a forced absence of a certain number of benefits from a standardized list
Inequality	Gini coefficient	An integrated measure of income concentration and inequality. An index from 0 (absolute equality) to 1 (absolute inequality), based on the Lorenz curve
	Quintile coefficient (80/20)	Assessment of the depth of income differentiation among the population. The ratio of incomes of the richest 20% to the incomes of the poorest 20%
Financial sustainability	Savings rate (in average per capita)	Household capital formation potential. The ratio of a household's gross savings to its disposable income (%)
	Investment rate (in average per capita)	Assessment of household investment activity. The ratio of a household's gross investment to its disposable income (%)

Source: developed by the author based on: Zavadsky (2024, p. 95-96), Shyshkin (2024, p. 3-4), https://ukraine.iom.int/sites/g/files/tmzbdl1861/files/documents/2025-01/economic-resilience-in-wartime_ukr-1.pdf and https://niss.gov.ua/sites/default/files/2024-02/az_eknerivnist_19022024.pdf.

reflection of changes in purchasing power amid limited microdata. The inputs included historical Compound Annual Growth Rate (CAGR), official financial statistics from the National Bank of Ukraine, and fiscal data from the Ministry of Finance of Ukraine. This multi-source triangulation provided a robust and practical inflation proxy for calculating the real indicators that follow.

The categories "Income" and "Expenditure" are quite broad in their own interpretation, so it is also necessary to consider their essence and structure. Household income is, as a rule, cash receipts received over a certain period of time. It can come from various sources, such as employment (wages), self-employment, agricultural work, income from capital (dividends, interest), as well as social transfers (old-age pensions, disability pensions, unemployment benefits, other social payments and benefits). Income can also include financial assistance of a social, family or educational nature. The level of income received can vary over time, regionally or depending on the type of household, including its size (number of members). Household size is one of the important factors determining income differences. Typically, the average income per person decreases with an increase in the number of people in the family. In large households, an increase in the number of members is often accompanied by a deterioration in the financial situation. The level of income also depends on socio-demographic factors, such as the profession, education and age of household members, geographical location and class of residence. Income has a fundamental impact on the financial situation of a household, allows it to meet the needs of its members and determines the limit of expenses (Laska, 2024, p. 96-97; Soria, 2018, p. 18; Honkkila & Kavonius, 2013, p. 4).

Disposable income, defined as income from employment, less social and health insurance contributions, income tax, and increased by cash transfers received from the state, can be used by a household for spending and saving. In fact, household income is the main source of meeting its needs (Balestra & Oehler, 2023, p. 13; Flores, 2021, p. 689). Household spending reflects their ability to meet needs, and the structure of spending shows the priorities and capabilities of the household. Studies show that the structure of spending of households of different sizes differs, which is due to different needs and capabilities to meet them. The growth of household income and the simultaneous decrease in the scale of income differentiation are reflected in an increase in consumer spending, a change in the structure of consumption, an increase in the level of savings, and an improvement in the quality of life of household members (Laska, 2024, p. 96-97).

Empirical Assessment of the Macroeconomic Condition of Ukrainian Households (2021–2024)

Table 2 presents the empirical data corresponding to the system of indicators theoretically substantiated in Table 1. The indicators encompass key dimensions of household well-being, including income, expenditure structure, poverty, inequality, and financial stability. Their integrated analysis provides a comprehensive understanding of the socio-economic transformations affecting Ukrainian households during the period 2021–2024. The presented data capture both the immediate and long-term consequences of the full-scale invasion and the associated macroeconomic disruptions. This empirical framework serves as a basis for evaluating the resilience and adaptive capacity of households under conditions of prolonged economic instability.

Table 2

System of actual indicators for assessing the macroeconomic condition of households in Ukraine in 2021–2024

Category	Indicator	2021	2022	2023	2024
Income [thousand UAH] (in average per capita)	Median disposable income	14,491	14,577	20,257	23,730
	Real disposable income	13,042	10,962	14,927	15,969
	Concentration of income by source	5.2	6.1	5.2	4.9
Costs [thousand UAH] (in average per capita)	Actual cost level	11,243	13,515	14,537	15,803
	Engel coefficient	45.9%	50.2%	52.3%	54.5%
	Concentration of consumer spending	2.7	2.9	2.9	3.0
Poverty [%]	Poverty risk level	20.6%	29.4%	35.5%	41.3%
	Absolute poverty level	1.3%	6.8%	8.8%	9.1%
	Level of social deprivation	24.4%	43.4%	51.6%	55.8%
Inequality	Gini coefficient	0.257	0.260	0.438	0.465
	Quintile coefficient (80/20)	3.8	4.1	6.3	6.5
Financial sustainability [%] (in average per capita)	Savings rate	12.5%	–11.2%	5.4%	6.8%
	Investment rate	3.2%	–5.6%	0.5%	0.8%

Source: developed by the author based on: State Statistics… (2025), Zavadsky (2024, p. 95-96), Shyshkin (2024, p. 3-4), https://ukraine.iom.int/sites/g/files/tmzbdl1861/files/documents/2025-01/economic-resilience-in-wartime_ukr-1.pdf and https://niss.gov.ua/sites/default/files/2024-02/az_eknerivnist_19022024.pdf.

According to Table 2, nominal median household disposable income showed growth during 2021–2024, increasing from UAH 14,491 in 2021 to UAH 23,730 in 2024. The largest jump (+39.0%) occurred in 2023 compared to 2022, while in 2022 the nominal growth was minimal (+0.6%). The projected growth for 2024 is +17.1%. However, real disposable incomes, adjusted for inflation, show

a different trend: in 2022 there was a sharp drop of –15.9% (from UAH 13,042 to UAH 10,962 in base year prices) due to the economic shock of the full-scale invasion and the accompanying inflation and devaluation of the national currency. In 2023, a significant recovery in real incomes began (+36.2% to UAH 14,927), but the projected growth for 2024 is much more modest (+7.0% to UAH 15,969), not reaching pre-war levels for many segments of the population. The concentration of income by source shows some stability in the main sources, where wages remain key (about 60%), although in 2022 there was an increase in dependence on other, perhaps less stable sources, such as social assistance or the use of savings.

The level of actual household spending has been growing steadily in nominal terms: from UAH 11,243 in 2021 to UAH 15,803 in 2024. The largest percentage increase (+20.2%) was observed in 2022 (to UAH 13,515), reflecting the peak of inflation. The growth rate has slowed down since then: +7.6% in 2023 (to UAH 14,537) and +8.7% in 2024. The key indicator of financial pressure is the Engel ratio, which shows the share of food spending. It has been growing steadily from 45.9% in 2021 to 54.5% in 2024 (an average of 2.9% per year). Such a significant increase (by almost 9 percentage points in 3 years) clearly indicates a deterioration in well-being, as households are forced to spend an increasing part of their budget on food, limiting other expenses. The concentration of consumer spending (index 2.7 in 2021 and 3.0 in 2024) also increased slightly, confirming the shift in the spending structure towards basic needs.

The poverty risk level (income below the actual subsistence minimum) more than doubled: from 20.6% in 2021 to 41.3% in 2024. The absolute poverty level (income below the statutory minimum) showed an even sharper increase: from 1.3% in 2021 to 9.1% in 2024. The level of social deprivation also grew rapidly, exceeding half of the population: from 24.4% in 2021 to 55.8% in 2024. These figures indicate a large-scale deterioration in the material situation of Ukrainians due to the war .

The war has significantly increased economic inequality. The Gini coefficient increased from 0.257 in 2021 to 0.465 in 2024 (an average of 0.9 absolute points each year), which is a relatively high indicator and indicates a deep income stratification. The quintile coefficient (S80/S20), which compares the incomes of the richest 20% and the poorest 20%, also increased sharply: from 3.8 in 2021 to 6.5 in 2024. This confirms that the economic consequences of the war have disproportionately hit the poorest segments of the population. This fact shows the general rule that the poorest groups of the population and the final consumers of goods and services suffer from any economic shocks, regardless of their primary cause.

The savings rate fell from a positive 12.5% in 2021 to a negative –11.2% in 2022, indicating a massive depletion of savings to support consumption. The situation improved in 2023 (savings rate +5.4%), and a slow trend of further recovery to 6.8% began in 2024, as households began to build financial reserves again, especially after the adaptation of the Ukrainian foreign exchange market

and the demonstration of a relatively stable exchange rate throughout 2024. The investment rate (mostly in housing) has also fallen sharply: from 3.2% in 2021 to –5.6% in 2022 (which may indicate asset sales or depreciation) and is recovering extremely slowly (0.5% in 2023 and 0.8% in 2024) due to security risks and limited financial instruments and opportunities.

The beginning of the active phase of hostilities in February 2022 caused a significant transformation in the income and expenditure structure of Ukrainian households, which is reflected in Table 3.

Table 3

Structure of household income and expenses in Ukraine in 2021–2024
(in average per capita)

Income structure	2021	2024	Cost structure	2021	2024
Labor remuneration	59.8%	62.2%	Food and soft drinks	52.6%	54.8%
Income from self-employment and entrepreneurial activities	5.7%	6.8%	Alcoholic beverages and tobacco products	3.4%	2.1%
Income from personal subsistence farming	2.5%	1.4%	Clothing and shoes	5.5%	5.0%
Property income	1.2%	4.2%	Housing, water, electricity	17.4%	19.6%
Pensions, scholarships and state social benefits	19.8%	15.0%	Healthcare	5.4%	3.9%
Assistance from non-governmental, volunteer foundations, organizations (UNICEF, UNDP, etc.)	0.0%	1.1%	Transport	5.2%	4.3%
Help from relatives	3.2%	2.8%	Communication	3.9%	3.2%
Benefits and subsidies	0.4%	0.6%	Recreation and culture	1.9%	1.8%
Using savings and loans	1.3%	1.8%	Education	1.1%	1.6%
Other income	6.1%	4.1%	Various goods and services	3.6%	3.7%

Source: developed by the author based on: State Statistics... (2025), Zavadsky (2024, p. 96), Zavhorodnia (2024, p. 3), Pashchenko & Zharikova, (2023, p. 40, 43), Shyshkin (2024, p. 3-4).

According to the data in Table 3, there have been noticeable changes in the structure of household income between 2021 and 2024. Labor wages strengthened their position as the main source, their share increased from 59.8% to 62.2%, which may indicate some adaptation of the labor market and an increase in nominal wages. At the same time, the share of pensions, scholarships and state social benefits decreased significantly – from 19.8% to 15.0%, which may be due to the slower indexation of these payments compared to salaries and general inflationary pressure. It is interesting to note the increase in the share of property income (from 1.2% to 4.2%) and the emergence of a noticeable share

of assistance from non-state, volunteer funds (1.1% in 2024), which is a direct consequence of the war and humanitarian support. The share of income from self-employment and entrepreneurship also increased slightly (from 5.7% to 6.8%), while the share of savings and loans remains small, although it has increased slightly (from 1.3% to 1.8%), indicating continued financial pressure.

The structure of expenditures clearly reflects the increasing pressure on household budgets and the focus on basic needs. The most significant is the increase in the share of expenditures on food and non-alcoholic beverages – from 52.6% in 2021 to 54.8% in 2024, which confirms the growth of the Engel coefficient and the impact of high food prices. The share of expenditures on housing, water, electricity also increased – from 17.4% to 19.6%, probably due to increased tariffs. At the same time, there is a decrease in the shares of expenditures on many other categories: alcohol and tobacco (from 3.4% to 2.1%), clothing and footwear (from 5.5% to 5.0%), healthcare (from 5.4% to 3.9%), transport (from 5.2% to 4.3%), communications (from 3.9% to 3.2%), and recreation and culture (from 1.9% to 1.8%). This indicates forced savings by households on non-priority goods and services to cover rising food and utility costs. The slight increase in the share of education (from 1.1% to 1.6%) may be due to various factors, including the shift to paid educational services.

Analysis of socio-economic indicators shows a shift in the population distribution towards low-income groups. In particular, the share of households with an average monthly income per person of less than UAH 3,000 increased from 21% to 30%. In contrast, the number of households with an income of more than UAH 10,000 per person decreased from 16% to 10%, which indicates an increase in income polarization and a general deterioration in the financial situation of the population. Thus, the total decrease in population income is estimated at 30%, which indicates a significant reduction in purchasing power and a deterioration in the financial situation of most households (Zavadsky, 2024, p. 89-91; Kogatko & Polyakov, 2024, p. 7-8).

The following trends are also observed across different household attributes – although average real incomes across the country recovered somewhat in 2023 compared to the decline in 2022, this dynamics was extremely uneven. Real household incomes in rural areas actually decreased by UAH 875 (in 2021 prices) between 2021 and 2023, while in urban households they increased by UAH 1,897. A similar trend is observed depending on the number of children: real incomes of large households (three or more children) decreased by UAH 1,145 over the same period, while incomes of households with one child increased by UAH 1,135. This indicates that the economic consequences of the war hit rural residents and large families hardest (Zavadsky, 2024, p. 89-91; Shyshkin, 2024, p. 3-6).

Data on how long households would have enough savings to last show a very low level of financial resilience in 2023. Over 64% of households had savings for only two months or less (15.4% less than a month, 27.8% one month, 21.3% two months). Only about 35% had a financial reserve for three months or more.

This is particularly worrying given that IOM data (as of end-2023) shows that 56% of IDPs have completely exhausted their savings. Such low financial resilience leaves a significant portion of the population extremely vulnerable to any further economic shocks or loss of income (Kotenko & Korotkova, 2023, p. 35-37; Shyshkin, 2024, p. 3-6).

Conclusions

An analysis of macroeconomic indicators of the state of households in Ukraine for the period 2021–2024, conducted using the developed system of indicators, revealed significant negative consequences of a full-scale invasion of the financial well-being of the population:

– despite the nominal growth in median incomes, real household incomes fell sharply in 2022 (–15.9%) and only partially recovered in 2023–2024, falling short of pre-war levels. Rural households and large families were particularly hard hit;

– there is a forced concentration of spending on basic needs. The Engel coefficient (the share of spending on food) has been steadily increasing, reaching 54.5% in 2024, indicating a significant decline in living standards. Households are forced to save on non-essential goods and services;

– poverty growth – indicators showed growth. The at-risk-of-poverty rate doubled (from 20.6% to 41.3%), the absolute poverty rate increased sevenfold (from 1.3% to 9.1%), and the level of social deprivation exceeded half of the population (from 24.4% to 55.8%);

– deepening inequality – the war significantly increased social stratification. The Gini coefficient increased from 0.257 to 0.465, and the quintile coefficient from 3.8 to 6.5, indicating a disproportionately strong impact on the poorest segments of society;

– undermining financial stability – the savings rate in 2022 became deeply negative (–11.2%), indicating a massive "eating away" of savings. Although there is a slow recovery of the ability to save in 2023-2024 (+5.4% and +6.8%, respectively), household investment activity remains extremely low (0.5% and 0.8%, respectively) due to risks and limited opportunities.

According to the conclusions, it is recommended to revise the criteria for determining household well-being, in particular the established subsistence minimum, the minimum wage and other indicators of household security – to more adequately reflect the real needs of the population and more effectively use social assistance. The revision of these indicators will allow better targeting of state, external and social support for the most vulnerable groups of households (internally displaced persons, large families, etc.) and rural residents – as identified above). Such measures would reduce financial pressure on households by raising the minimum standard of well-being.

The research findings, derived from an integrated system of universal macroeconomic indicators, possess direct and significant practical value for government policy, social planning, and the coordination of international aid during Ukraine's wartime and recovery periods. Specifically, the identified large-scale deepening of poverty, the doubling of the at-risk-of-poverty rate, and the sustained high Engel coefficient (reaching 54.5% in 2024) serve as a clear justification for the immediate revision of official social welfare criteria. This includes adjusting the established subsistence minimum and minimum wage to more adequately reflect the real needs of the population under severe inflationary and economic pressure. Furthermore, the analysis provides empirical evidence necessary for highly effective targeted social support: the disproportionately negative impact on rural residents and large families, alongside the confirmation that a significant portion of Internally Displaced Persons have exhausted their savings, allows policymakers to develop differentiated rules for state, external, and humanitarian assistance. The observed sharp decline in the savings rate and the extremely low investment rate are critical macroeconomic signals that inform strategies for restoring financial stability and building consumer confidence for the medium-term recovery phase.

Further research into regional and demographic differences in the socioeconomic status of households is important to develop differentiated support measures.

Translated by Authors

References

Balestra, C., & Oehler, F. (2023). Measuring the joint distribution of household income, consumption and wealth at the micro level. *OECD Papers on Well-being and Inequalities*, *11*, 1-109. https://doi.org/10.1787/f9d85db6-en.

Cantarella, M., Neri, A., & Ranalli, M.G. (2021). Mind the wealth gap: A new allocation method to match micro and macro statistics on household wealth. Bank of Italy Economic Research and International Relations Area. *Occasional Papers*, *646*. https://doi.org/10.48550/arXiv.2101.01085.

Deaton, A. (1997). *The analysis of household surveys: a microeconometric approach to development policy*. World Bank Publications. Retrieved from https://documents1.worldbank.org/curated/en/593871468777303124/pdf/17140-PUB-revised-PUBLIC-9781464813313-Updated.pdf (15.09.2025).

Flores, I. (2021). The capital share and income inequality: Increasing gaps between micro and macro-data. *The Journal of Economic Inequality*, *19*(4), 685-706.

Grzywińska-Rąpca, M. (2021). Economic welfare and subjective assessments of financial situation of European households. *European Research Studies Journal*, *XXIV* (2), 948-968.

Hoddinott, J., & Quisumbing, A. (2010). Methods for microeconometric risk and vulnerability assessment. In Risk, shocks, and human development: On the brink. London: Palgrave Macmillan UK.

Honkkila, J., & Kavonius, I.K. (2013). Micro and macro analysis on household income, wealth and saving in the euro area. *ECB Working Paper*, *1619*, 1-43. Retrieved from https://www.econstor.eu/bitstream/10419/154052/1/ecbwp1619.pdf (15.09.2025).

Institute of Demography and Quality of Life Problems of the National Academy of Sciences of Ukraine. (2024). Socio-Economic State of Households in Ukraine in 2021 & 2023. Retrieved from https://www.unicef.org/ukraine/documents/social-economical-state-2023-24 (24.09.2025).

International Organization for Migration (IOM). (2024). Economic Resilience in Wartime: Income, Employment and Social Assistance in Ukraine. Retrieved from https://ukraine.iom.int/sites/g/files/tmzbdl1861/files/documents/2025-01/economic-resilience-in-wartime_ukr-1.pdf (10.10.2025).

Kogatko, Y., & Polyakova, S. (2024). Level of Material Deprivation in Ukraine: The Impact of the Economic Crisis, Covid-19 and War. *Economy and Society*, *67*. https://doi.org/10.32782/2524-0072/2024-67-37.

Kotenko, T.M., & Korotkova, D.S. (2023). Factors of Consumer Behavior of Households in Ukraine in the Pre-War and War Periods: A Collective Approach to Definition and Assessment. *Statistics of Ukraine*, *2*(101), 31-40. https://doi.org/10.31767/su.2(101)2023.02.04.

Laska, K. (2024). Assessment of Income Differentiation of Different-Sized Households in Poland. *Olsztyn Economic Journal*, *19*(1), 93-102. https://doi.org/10.31648/oej.10571.

Mjeda, T., Vlahinić Lenz, N., & Cerović, L. (2021). The microeconomic approach to food demand modelling: Empirical results for Croatian households. *Economic Research-Ekonomska istraživanja*, *34*(1), 1079-1093.

Pashchenko, O.V., & Zharikova, O.B. (2023). Methodological Principles of Analysis of Household Expenditures in Ukraine. *Economics and Business Management*, *14*(3), 34-52. https://doi.org/10.31548/economics14(3).2023.027.

Shyshkin, V. (2024). Changes in the Level and Structure of Household Income in Ukraine under the Influence of a Full-Scale War. *Economy and Society*, *62*. https://doi.org/10.32782/2524-0072/2024-62-166.

Soria, M.T. (2018). An analysis of income distribution by linking household surveys with national accounts measurements. *Proceedings 61th ISI World Statistics Congress*, 16-21 July 2017, Marrakech (Session STS093).

State Statistics Service of Ukraine. (2025). Official site of State Statistics Service of Ukraine. Retrieved from https://stat.gov.ua/uk (25.10.2025).

Wilde, P.E. (2000). The analysis of household surveys: a microeconometric approach to development policy. *Oxford Journals*, *82*(3), 780-782.

Zavadsky, G.M. (2024). Socio-Economic State of Households in Ukraine in War Conditions. *Economic Strategy and Prospects for the Development of the Trade and Services Sector*, *2*(36), 88-99. Retrieved from https://repo.btu.kharkov.ua//handle/123456789/61542 (24.10.2025).

Zavhorodnia, S. (2024). *Economic Inequality Among the Population of Ukraine in the Context of Ensuring Sustainability.* National Institute for Strategic Studies. Retrieved from https://niss.gov.ua/sites/default/files/2024-02/az_eknerivnist_19022024.pdf (24.10.2025).

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ORIGINAL PAPER

EU-ORIENTED TRAJECTORIES OF SUSTAINABLE DEVELOPMENT OF UKRAINIAN TRANSPORT SECTOR: COMPARISON WITH POLAND

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Abstract

This study examines the sustainable development of Ukraine's transport sector amid Ukraine's EU integration. It aims to assess how Ukraine's sustainable transport trajectories align with EU-27 trends, with particular focus on Poland. The system of sustainable transport and mobility indicators was constructed based on the SuM4All methodological framework, which ensures a comprehensive and coherent representation of environmental, economic, and social dimensions. The research covers three periods: before COVID-19, during the pandemic, and during Russia's aggression against Ukraine (2022–2023). The comparative analysis of efficiency, universal access, safety, and environmental performance employed official statistics from Ukraine, Poland, the EU, OECD, the World Bank, and national professional associations. The findings reveal that Ukraine's transport sector only partially follows the EU trajectories. Notably, indicators of universal access and efficiency display trends opposite to those in the EU, while road safety has been gradually improving but remains below the EU average. The environmental dimension demonstrates the strongest relative progress, which may be associated with the gradual decline in transport activity in Ukraine. These results can be used to develop scenarios for the sustainable and resilience-based transformation of Ukraine's transport sector in the process of EU integration.

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TRAJEKTORIE ZRÓWNOWAŻONEGO ROZWOJU UKRAIŃSKIEGO SEKTORA TRANSPORTU UKIERUNKOWANE NA UE: PORÓWNANIE Z POLSKĄ

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Kody JEL: R40, Q56, O18.

S ł o w a k l u c z o w e: zrównoważony transport, rozwój sektora transportowego, Unia Europejska, Polska, Ukraina.

A b s t r a k t

Badanie analizuje zrównoważony rozwój sektora transportu na Ukrainie w kontekście integracji kraju z UE. Celem jest ocena, w jaki sposób trajektorie zrównoważonego rozwoju transportu na Ukrainie odpowiadają trendom w UE-27, ze szczególnym uwzględnieniem Polski. System wskaźników zrównoważonego transportu i mobilności został opracowany na podstawie podejścia metodologicznego SuM4All, które zapewnia kompleksowe i spójne ujęcie aspektów środowiskowych, ekonomicznych i społecznych. Badanie obejmuje trzy okresy: przed pandemią COVID-19, w czasie jej trwania oraz w okresie agresji Rosji przeciwko Ukrainie (2022–2023). Analiza porównawcza efektywności, powszechnego dostępu, bezpieczeństwa i wyników środowiskowych wykorzystuje oficjalne dane statystyczne Ukrainy, Polski, UE, OECD, Banku Światowego oraz krajowych stowarzyszeń zawodowych. Wyniki wskazują, że sektor transportowy Ukrainy jedynie częściowo podąża za trajektoriami UE. W szczególności wskaźniki powszechnego dostępu i efektywności wykazują tendencje odwrotne do obserwowanych w UE, podczas gdy bezpieczeństwo ruchu drogowego stopniowo się poprawia, lecz nadal pozostaje poniżej średniego poziomu UE. Wymiar środowiskowy wykazuje największy względny postęp, co może być związane z stopniowym spadkiem aktywności transportowej na Ukrainie. Wyniki mogą posłużyć do opracowania scenariuszy zrównoważonej i odpornej transformacji sektora transportu Ukrainy w integracji z UE.

Introduction

The transport system is crucial for the resilience of domestic and international supply chains and, during the war, enabled alternative routes for strategic goods. Today the sector faces large-scale reconstruction requiring rapid transformation that reflects geopolitical, defence, demographic, and production shifts (*National Transport Strategy…*, 2025; *Ukraine – Fourth Rapid Damage…*, 2025). This transformation should follow the 'build back better' principle (Modrzyńska *et al.*, 2025) and align with EU integration. Although the war has not altered Ukraine's EU-accession goals, it has slowed reforms: the transportation and storage sector shows the weakest progress in implementing the EU–Ukraine Association Agreement, with only 58% of tasks completed by 2024 (*Report on Implementation…*, 2025). In this study, we focus on the sustainable development of transport, which

serves as the framework for the expected strategic effects of reforms. The aim of the study is to assess the extent to which the sustainable development trajectories of Ukraine's transport align with EU-27 trends, as well as to evaluate Ukraine's relative position by comparing it with Poland, a neighboring EU member state with a structurally comparable transport system.

Theoretical framework

Sustainable transport development is directly related to global objectives such as building sustainable infrastructure through innovation (SDG 11), halving road deaths by 2030 (SDG 3.2), and creating safe, inclusive, and resilient cities (SDGs 9 and 11) (Vieira *et al.*, 2022). It is also linked to SDGs addressing climate action (SDG 13), affordable and clean energy (SDG 7), zero hunger (SDG 2), and quality education (SDG 4) (*Global Mobility…*, 2023). The *Sustainable Mobility for All (SuM4All)* initiative integrates these goals into four pillars – *universal access, efficiency, safety,* and *green mobility* – forming the *Global Sustainable Mobility Index* (*Mobility Performance…*, 2020, 2022). This index measures progress in the movement of goods and people, as well as in population mobility opportunities. Hence, it can be regarded as the *Global Index of Sustainable Transport and Mobility*, and four pillars proposed by SuM4All – as the *Sustainable Development Goals for Transport and Mobility* (*SDTMGs*).

Sustainable development (SD) implies a balance among environmental, economic, and social dimensions, though such equilibrium remains difficult to achieve. Baum (2021) stresses that "sustainable development should prioritise social issues and challenges," while Giddings *et al.* (2002) highlight the importance of "what the policy priorities are, how decisions are made and in whose interest." Giddings *et al.* warned that separating SD dimensions causes harm – a tendency still visible in research (Del-Aguila-Arcentales *et al.*, 2022). The SDTMGs integrate environmental (*green*), economic (*efficiency*), and social (*universal access* and *safety*) dimensions, forming a coherent model of sustainable mobility (Tab. 1). Although the SuM4All framework lacks an explicit link between safety and efficiency, this relationship is implicit in SDG 9, which emphasises building resilient infrastructure and minimising risks of system failures, including transport safety. For instance, broken rails are among the causes of freight train derailments, directly linking safety and efficiency in rail transport (Liu *et al.*, 2014). The SuM4All systemic approach to sustainable transport enabled the formulation of the following research questions:

RQ1. To what extent do the sustainable development trajectories of Ukraine's transport align with the development trajectories of the EU-27 and Poland across the four SuM4All dimensions?

RQ2. How do the rates of change in sustainable development indicators of Ukraine's transport differ from those of Poland and the EU-27 across the four SuM4All dimensions?

RQ3. How do the rates of change in sustainable development indicators of Ukraine's transport differ from those of Poland and the EU-27 within each SuM4All dimension across three periods: pre-COVID, the COVID-19 period, and wartime?

Table 1

Matrix of links between the Global Sustainable Development Goals (SDGs), sub-goals and sustainable transport and mobility targets

Sustainable transport and mobility goals	Universal access (UnA)	Safety (Saf)	Green (Gr)	Efficiency (Eff)
Universal access (UnA)	SDG 5 (5.1, 5.2, 5.5)	SDG 11 (11.2)	SDG 11 (11.2 for UnA; 11.6 for Gr); SDG 9 (9.1 for UnA, 9.4 for Gr)	SDG 9 (9.1)
Safety (Saf)		x	SDG 3 (3.6 for Saf; 3.4 and 3.9 for Gr); SDG 11 (11.2 for Saf; 11.6 for Gr)	x
Green (Gr)			SDG 13 (13.1, 13.2)	SDG 7 (7.3), SDG 9 (9.4)
Efficiency (Eff)				SDG 12 (12.3, 12.C), SDG 17 (17.14)

Note: SDGs according to the 2030 Agenda for sustainable development by UN https://sdgs.un.org/2030agenda

Source: own elaboration based on Global Sustainable Mobility Report 2022 by the Sustainable Mobility for All (SuM4All^{TM}) initiative.

Climate change is a key global megatrend, and transport is a major contributor. The sector produces 23% of GHG emissions in its member countries (excluding international shipping and aviation), with 88% coming from road transport. Only 38% of workers use low-carbon commuting modes, including 26% who rely on public transport (OECD, 2024). Climate change increases demands for transport system resilience through effects on related sectors such as agriculture and tourism, and through direct impacts like rising temperatures, floods, and "black swan" events including wars (Bolengo *et al.*, 2019). It also fosters stronger cross-sectoral integration of transport with energy and construction (Vieira *et al.*, 2022).

The quantity, quality, and productivity of transport affect both GHG emissions and mobility accessibility. Ageing assets and infrastructure are common across

Europe (Yannis & Chaziris, 2022). Vehicle age also influences road-crash frequency, though less than human factors (Thomas *et al.*, 2013). Addressing these challenges requires innovative, integrated approaches that reflect socio-economic trends and ecosystem changes. The global ageing of populations (Bianchini *et al.*, 2019) forces adaptation of transport systems (Lin & Cui, 2021). In Ukraine, ageing transport assets and population form a "symbiotic assemblage under rigid social assistance policies", with older tram and trolleybus users acting as "co-creators of urban space" (Vazyanau, 2024).

Given the overall similarity of environmental and socio-economic problems and challenges faced by the transport services sector in Ukraine and other European countries, we formulated the following hypothesis: the development of sustainable transport in Ukraine aligns with the general trajectories observed in the EU-27 and Poland across the four SuM4All dimensions, yet the pace of progress in Ukraine is comparatively slower, and the magnitude of this lag varies depending on the specific dimension.

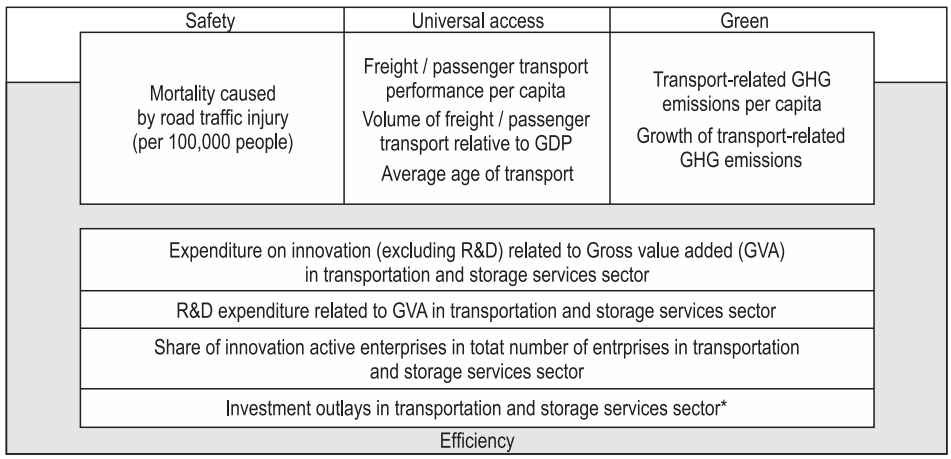
Research methodology

A review of academic literature and official reports on sustainable transport in the EU and Ukraine informed the research questions and hypothesis. A descriptive and comparative design based on the SuM4All framework structured the assessment across four dimensions: accessibility, efficiency, safety, and green mobility (Tab. 1).

Analysis used publicly available data from Eurostat, Statistics Poland, the State Statistics Service of Ukraine, national reports, EU Commission reports, OECD and World Bank datasets, and sectoral associations. The EU-27 average served as a benchmark to evaluate Ukraine's relative position and highlight Poland's transport development. Poland was chosen as a reference due to its comparable transport modes, network connections, and population size.

Empirical analysis covered three periods: pre-COVID (up to 2019), COVID-19 (2019–2021), and the war (2022–2023), with comparisons only for overlapping years. Limited data excluded 2024 and prevented full dynamic analysis from 2005, Poland's first full EU membership year. Specifically, freight and passenger volumes and investment outlays were analyzed for 2010–2023 due to data limitations.

Choice of base years depended on the purpose: the first year of the time series for long-term trends, 2015 for SDGs under the 2030 Agenda, and 1990 for the goal of reducing transport GHG emissions under the European Green Deal.



* The indicator only for comparative analysis of countries, not counties and EU.

Fig. 1. Indicators of sustainable development of transport
Source: own elaboration based on SDTMGs proposed by SuM4All (Tab. 1).

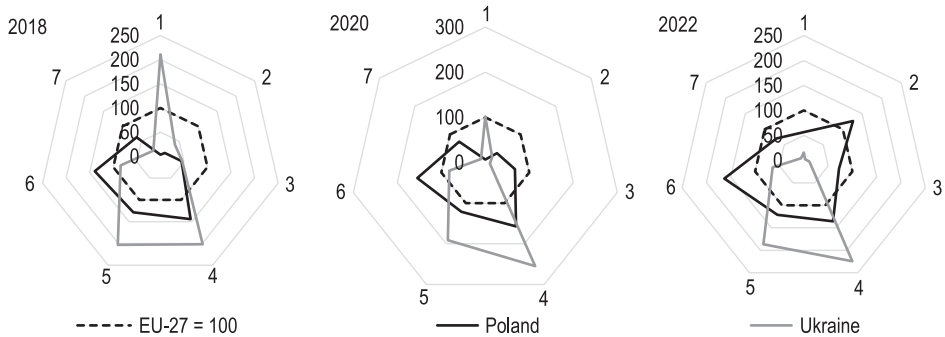
The Ukrainian indicators reflect crisis constraints (missing data from occupied areas and military movements) and require cautious interpretation, yet remain suitable for descriptive comparisons. Differences in statistical methodologies between Ukraine and the EU (European Commission, 2023, 2024) required methodological compromises, detailed in the notes to tables and figures.

Research results

The sustainable development profiles of the transport sectors of Poland and Ukraine are shown in Figure 2. These profiles illustrate the relative positions of the two countries' transport systems compared with the EU average.

The indicator *"Transport-related GHG emissions per capita"* was not included in the profile, since the corresponding values for Ukraine are almost negligible compared with the EU (0.04–0.05% relative to the EU). The European Union has set a target of reducing net greenhouse gas emissions by at least 55% by 2030 compared with 1990. In 2021, compared with 1990, the changes in GHG emissions from transport were as follows: EU + 15.7%, Poland + 228.7%, and Ukraine – 69.9%[1]. Despite this significant reduction of emissions in Ukraine, the country's transport fleet remains exceptionally old. Figure 2 demonstrates

[1] The growth rates of GHG emissions from transport were determined on the basis of *Annual European Union Greenhouse Gas Inventory 1990–2020 and Inventory Report 2022* (2022); *Poland's National Inventory Document 2025: Greenhouse Gas Inventory 1988–2023* (2025); and *Ukraine's Greenhouse Gas Inventory Report 1990–2021* (2023).



1 – Expenditures on R&D at enterprises relative to Gross value added (GVA) in transportation and storage services sector, %
2 – Expenditures on innovation activity (excl. R&D expenditures) at enterprises relative to Gross value added (GVA) in transportation and storage services sector, %
3 – Share of innovation active enterprises in total number of enterprises in transportation and storage services sector, %
4 – Mortality caused by road traffic injuries, number per 100,000 people (data for Ukraine for 2022 are unavailable; therefore, data for the EU, Poland, and Ukraine for 2021 were used in the 2022 profile)
5 – Average age of passenger cars, years
6 – Freight transport performance per capita, tonne-kilometres per capita
7 – Passenger transport performance per capita, passenger-kilometres per capita

Fig. 2. Sustainable development profiles of the transport sector in Poland and Ukraine, in % relative to the EU-27 (EU-27 = 100)

Source: own elaboration based on Eurostat database, State Statistics Service of Ukraine, European Commission (*EU transport in figures – Statistical pocketbook 2024, 2024*), European Automobile Manufacturers' Association (ACEA) (*Vehicles in use – Europe, 2018, 2021, 2022*), and Information & Analytical Group 'Auto Consulting' (Ukraine).

that the average age of passenger cars in Ukraine is far higher than in Poland and the EU, and continues to increase. This is particularly problematic in the road-transport segment, which belongs to the 'dirtiest' categories in environmental terms. In 2020, the average age exceeded the EU-27 level by 191%, and in 2022 – by 187%.

Unfortunately, official statistics on the average age of other transport modes in Ukraine are not available, although there are data on the age and continuing ageing of rolling stock by specific modes. At the end of 2023, 56.5% of diesel locomotives and 58.8% of freight wagons were 26–40 years old; 84.2% of passenger rail carriages were older than 28 years; 41.7% of diesel and 69.1% of electric locomotives exceeded 40 years; 50.2% of trolleybuses, 89.3% of trams, and 86.2% of subway carriages were older than 16 years – the oldest age group recorded in official statistics (*Transport of Ukraine…,* 2024). The average age of inland-waterway vessels in 2020 was 36 years (Bassani *et al.*, 2023). The slow pace of renewal of electric transport, which has the smallest environmental impact, indicates that fleet ageing does not contribute to a decrease in GHG emissions.

Another factor affecting emissions is transport performance. The average annual growth of freight and passenger transport performance (Tab. 2) demonstrates the widening gap between Ukraine and the EU, particularly Poland, during 2005–2023.

Table 2

Average annual growth of freight and passenger transport performance, % change compared to previous year

	2005–2013	2014–2018	2019–2021	2022–2023
Freight transport performance				
European Union – 27 countries	+0.1	+2.1	+1.1	–0.5
Poland	+2.4	+4.0	+2.3	+1.3
Ukraine	–0.1	–1.8	–2.0	–15.0
Passenger transport performance				
European Union – 27 countries	+0.5	+1.7	–4.5	+9.8
Poland	+1.7	+3.5	–2.3	+9.5
Ukraine	+0.1	–3.6	–7.9	–11.9

Note: Explanation of the selected time periods for analysis: 2005 – the first full year of Poland's membership in the EU; 2014 – the beginning of Russia's invasion of Ukraine, the occupation of Crimea and parts of the Donetsk and Luhansk regions; 2019–2021 – the COVID period; 2022 – the beginning of Russia's full-scale invasion of Ukraine.

Source: own elaboration based on the Eurostat database, the State Statistics Service of Ukraine, and the European Commission (*EU Transport in Figures – Statistical Pocketbook 2024*, 2024).

The performance of freight and passenger transport in Ukraine lags behind that of the EU and shows an opposite trend compared with Poland, both in per capita terms (Fig. 2) and relative to GDP (Fig. 3).

The trajectories of freight and passenger transport in Ukraine indicate a long-term decline in transport accessibility. Transport performance – particularly passenger transport – has deteriorated sharply since 2014, following the first phase of Russia's invasion. The pandemic affected Ukraine's transport sector more severely than that of the EU and Poland, demonstrating lower system resilience. The full-scale invasion in 2022 caused an additional collapse in performance indicators. Although the temporary suspension of civil aviation due to hostilities is expected to be lifted after the war, improving the productivity of the transport sector remains a major challenge for businesses as well as for regional and national governance.

The renewal and expansion of transport services require consistent annual investment. The dynamics of total investment in the transportation and storage services sector in Poland and Ukraine are presented in Figure 4.

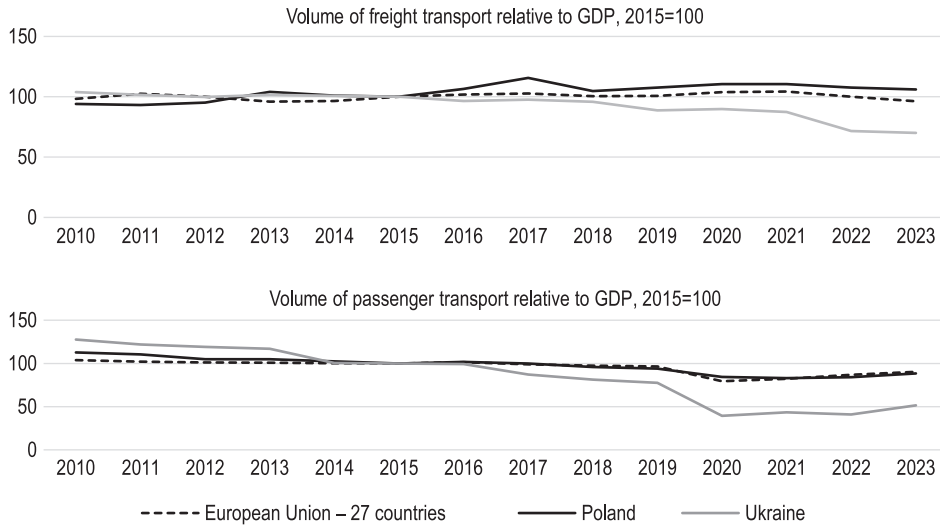


Fig. 3. Volume of freight and passenger transport in the EU, Poland, and Ukraine [2], in % change compared to 2015 (chain-linked volumes, at 2015 exchange rates)
Source: own elaboration based on Eurostat database, State Statistics Service of Ukraine, and European Commission (*EU transport in figures – Statistical pocketbook 2024, 2024*).

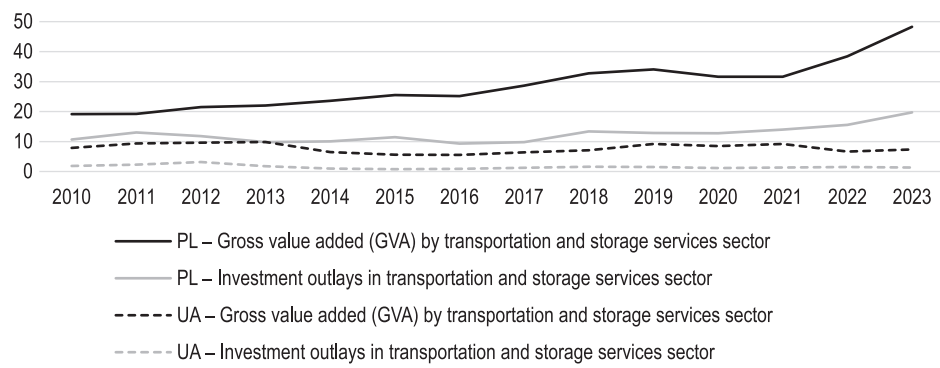


Fig. 4. Value of investment outlays in transportation and storage services sector and Gross value added by transportation and storage services sector of Poland and Ukraine in 2010–2023, in current prices, in million EUR
Source: own elaboration based on Eurostat database (online data code: nama_10_a64), Statistics Poland and State Statistics Service of Ukraine.

[2] In the calculation of the freight transport performance indexes for the EU and Poland, the indicator *"Road transport performance adjusted for territoriality"* was replaced with *"Road transport: national and international haulage"* to enable comparative analysis with Ukraine. In the calculation of Ukraine's index, pipeline transport was limited to *oil pipeline* only, to ensure comparability with the EU and Poland.

The contribution of the sector to GDP in Poland has been growing at a faster rate than investment itself, which confirms the effectiveness of these investments. In Ukraine, the contribution of the sector to GDP has not increased, which may indicate a policy aimed at maintaining only a certain level of investment efficiency within the sector.

The efficiency of investment in Poland's transport subsector is confirmed by progress in freight and passenger transport performance (Tab. 3). The increase in transport productivity occurs despite the fact that the land and pipeline transport subsector consistently receives a smaller share of total investment than warehousing and support activities, for example, in 2023 it accounted for 23.3% versus 75.6%. In Ukraine, the opposite allocation is typical, with land and pipeline transport receiving the larger share and warehousing and support activities the smaller, for example, in 2023 the shares were 71.7% and 23.6%, respectively. However, the total volume of investment in Ukraine remains significantly lower than in Poland.

Table 3

Selected indicators of transportation and storage services sector in Poland and Ukraine

Indicator and country	units of measurement	2015	2018	2021	2023
Poland					
Investment outlays (total)	billion EUR	11.4	13.4	14	19.7
	% change compared to 2015	100	+17	+23	+73
Share of land and pipeline transport sub-sector in total investment outlays in sector	% of total	28.0	20.2	26	23.3
	% change compared to 2015	100	–28	–7	–17
Freight transport performance	billion tonne-kilometres	346.1	404.6	459.6	471.4
	% change compared to 2015	100	+17	+33	+36
Passenger transport performance	billion passenger-kilometres	273.4	314.5	284.9	341.2
	% change compared to 2015	100	+15	+4	+25
Ukraine					
Investment outlays (total)	billion EUR	0.8	1.6	1.4	1.4
	% change compared to 2015	100	+107	+81	+81
Share of land and pipeline transport sub-sector in total investment outlays in sector	% of total	43.4	61.9	63.6	71.7
	% change compared to 2015	100	+43	+46	+65
Freight transport performance	billion tonne-kilometres	264.9	272	255.7	179.8
	% change compared to 2015	100	+3	–3	–32
Passenger transport performance	billion passenger-kilometres	97.1	104.4	62.7	39.4
	% change compared to 2015	100	+8	–35	–59

Note: Explanation of the selected time periods for analysis: 2018 – the year preceding the COVID outbreak; 2021 – the year before Russia's full-scale invasion of Ukraine; 2023 – the second year of the war in Ukraine.

Source: own elaboration based on the Eurostat database, Statistics Poland, and the State Statistics Service of Ukraine.

The increase in transport productivity depends on both investment and enterprise-level innovation. The innovation activity of Ukraine's transport declined during 2018–2022 (Fig. 2), with the share of innovation-active enterprises and innovation expenditures (excluding R&D) lagging behind the EU. R&D expenditures exceeded the EU level in 2018 (210.9%) and 2020 (101.8%), yet transport performance did not reflect their effectiveness. The innovative activity indicators of Poland's transport sector also remain below the EU-27 average but show steady progress, reaching 126.3% of EU-27 innovation expenditures in 2022, with transport performance indicators confirming efficiency of innovation efforts. In both countries, innovation is higher in warehousing, support, and postal/courier activities than in the transport.

Notably, in 2022, the share of innovation-active enterprises increased, although innovation intensity declined: the number introducing new products fell by 43.75% and those introducing new business processes by 23.07%. The stronger focus on process innovations reflects the need to address logistical challenges.

Conclusions

This article assessed the extent to which the sustainable transport development trajectories of Ukraine align with EU-27 and Polish trends across the four SuM4All dimensions. The hypothesis that Ukraine is generally moving in a European direction was only partially confirmed: safety has gradually improved, accessibility and efficiency have deteriorated, and the formal reduction in GHG emissions has resulted from declining transport activity rather than genuine decarbonisation. Comparison with Poland showed that Polish indicators display steady positive progress across all sustainability dimensions, while the divergence from Ukraine stems from Poland's ability to ensure continuous development and infrastructure modernisation. Poland's experience in sustainable transport development may serve as a reference point for Ukrainian reforms.

Before the COVID-19 pandemic, Ukraine's transport sector demonstrated certain positive trends, yet the gap from EU averages remained substantial. The pandemic and the 2022–2023 war further worsened accessibility and efficiency. The pandemic period revealed the higher vulnerability of Ukraine's transport system to crisis shocks. To develop the transport sector in line with EU objectives and Polish experience, a comprehensive transformation is required with a focus on efficiency and universal accessibility. This should be achieved through faster legislative reforms, strengthened institutional capacity, the introduction of targeted programmes for financing innovative renewal, and improved marketing of transport services.

The key contribution of this study is the presentation of a systemic view of sustainable transport development dynamics in Ukraine in the context

of its alignment with EU-27 trajectories on the path toward EU integration. The findings provide an empirical foundation for further research on the sustainability of Ukraine's transport sector and underscore the importance of differentiated monitoring of each dimension during the ongoing and post-war recovery and Ukraine's integration into the EU.

Translated by the Author

References

Annual European Union Greenhouse Gas Inventory 1990–2020 and Inventory Report 2022. (2022). European Environment Agency. Retrieved from https://www.eea.europa.eu/en/analysis/publications/annual-european-union-greenhouse-gas-1.

Bassani, A., Bjerde, A.M., Garcia Mora, A., & Lund, S.M. (2023). *Private Sector Opportunities for a Green and Resilient Reconstruction in Ukraine: Synthesis Report (English)* (Vol. 1). World Bank Group. Retrieved from https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099113510312314960.

Baum, R. (2021). Sustainable Development – A Modern Understanding of the Concept. *Annals of the Polish Association of Agricultural and Agribusiness Economists. Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*, *XXIII*(2), 9-29. https://doi.org/10.22004/AG.ECON.324086.

Bianchini, M., Schleicher, M.J., & Wu, Y. (2019). Adapting regional development policy to future megatrends. In *OECD Regional Outlook 2019: Leveraging Megatrends for Cities and Rural Areas*. OECD Publishing. https://doi.org/10.1787/9789264312838-en.

Bolengo, A., Charbit, C., Crook, J., Daniele, F., Gars, J., Haxton, P., Jung, T., Kleine-Rueschkamp, L., Lembcke, A.C., Matsumoto, T., McDonald, C., Piccinni, A., Romano, O., Sanabria, A., Tropp, H., & Veneri, P. (2019). Preparing regions for demographic and environmental transformations. In *OECD Regional Outlook 2019: Leveraging Megatrends for Cities and Rural Areas*. OECD Publishing. https://doi.org/10.1787/9789264312838-en.

European Commission. (2023). *Ukraine 2023 Report. Accompanying the document 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions'. 2023 Communication on EU Enlargement policy*. [Staff working document]. Retrieved from https://op.europa.eu/en/publication-detail/-/publication/a0f3eaa6-7eee-11ee-99ba-01aa75ed71a1.

European Commission. (2024). *Ukraine 2024 Report. Accompanying the document 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions'. 2024 Communication on EU Enlargement policy*. [Staff working document]. Retrieved from https://enlargement.ec.europa.eu/document/download/1924a044-b30f-48a2-99c1-50edeac14da1_en?filename=Ukraine%20Report%202024.pdf.

Del-Aguila-Arcentales, S., Alvarez-Risco, A., Jaramillo-Arévalo, M., De-la-Cruz-Diaz, M., & Anderson--Seminario, M. d. l. M. (2022). Influence of Social, Environmental and Economic Sustainable Development Goals (SDGs) over Continuation of Entrepreneurship and Competitiveness. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(2), 73. https://doi.org/10.3390/joitmc8020073.

EU transport in figures – Statistical pocketbook 2024. (2024). Publications Office of the European Union. https://doi.org/doi/10.2832/16593.

Giddings, B., Hopwood, B., & O'Brien, G. (2002). Environment, economy and society: fitting them together into sustainable development. *Sustainable Development*, *10*(4), 187-196. https://doi.org/10.1002/sd.199.

Global Mobility Report 2022: Tracking Sector Performance. (2023). Sustainable Mobility for All. Retrieved from https://www.sum4all.org/sites/default/files/d7/global_mobility_report_2022_04052023_final.pdf.

Lin, D., & Cui, J. (2021). Transport and Mobility Needs for an Ageing Society from a Policy Perspective: Review and Implications. *International Journal of Environmental Research and Public Health*, *18*(22), 11802. https://doi.org/10.3390/ijerph182211802.

Liu, X., Lovett, A., Dick, T., Rapik Saat, M., & Barkan Christopher, P.L. (2014). Optimization of Ultrasonic Rail-Defect Inspection for Improving Railway Transportation Safety and Efficiency. *Journal of Transportation Engineering*, *140*(10), 04014048. https://doi.org/10.1061/(ASCE)TE.1943-5436.0000697.

Mobility Performance at a Glance: Country Dashboards 2020. (2020). Sustainable Mobility for All. Retrieved from https://www.sum4all.org/sites/default/files/d7/mobilityataglancereport-2020-spread-web.pdf.

Mobility Performance at a Glance: Country Dashboards 2022. (2022). Sustainable Mobility for All. Retrieved from https://www.sum4all.org/sites/default/files/d7/mobilityataglancereport-2022-pagebypage_web.pdf.

Modrzyńska, J., Szpak, A., & Willa, R. (2025). The concept of 'building back better' and the reconstruction of Ukraine and its cities. *European Planning Studies*, *33*(1), 1-19. https://doi.org/10.1080/09654313.2024.2405960.

National Transport Strategy of Ukraine for the Period up to 2030. Resolution of the Cabinet of Ministers of Ukraine of December 27, 2024, No. 1550, Revision on March 13, 2025. (2025). Verkhovna Rada of Ukraine. Retrieved from https://zakon.rada.gov.ua/laws/show/1550-2024-п?lang=en#Text.

OECD. (2024). Towards sustainable transport in regions and cities. In *OECD Regions and Cities at a Glance 2024*. OECD Publishing. https://doi.org/10.1787/f42db3bf-en.

Poland's National Inventory Document 2025: Greenhouse Gas Inventory 1988–2023. (2025). National Centre for Emission Management (KOBiZE); Institute of Environmental Protection – National Research Institute. Retrieved from https://www.kobize.pl/pl/fileCategory/id/16/krajowa-inwentaryzacja-emisji.

Report on Implementation of the Association Agreement between Ukraine and the European Union for 2024. (2025). Retrieved from https://eu-ua.kmu.gov.ua/wp-content/uploads/Zvit-Ugoda-pro-asotsiatsiyu-EN.pdf.

Thomas, P., Morris, A., Talbot, R., & Fagerlind, H. (2013). Identifying the causes of road crashes in Europe. Annals of advances in automotive medicine. Association for the Advancement of Automotive Medicine. *Annual Scientific Conference*, *57*, 13-22. Retrieved from https://pmc.ncbi.nlm.nih.gov/articles/PMC3861814/.

Transport of Ukraine 2023. (2024). State Statistics Service of Ukraine. Retrieved from https://www.ukrstat.gov.ua.

Ukraine – Fourth Rapid Damage and Needs Assessment (RDNA4): February 2022 – December 2024 (English). (2025). European Union, Nations, United, Government of Ukraine, World Bank, Washington. Retrieved from http://documents.worldbank.org/curated/en/099022025114040022.

Ukraine's Greenhouse Gas Inventory Report 1990–2021. Annual National Inventory Report for Submission under the United Nations Framework Convention on Climate Change and the Kyoto Protocol. (2023). Ministry Environmental Protection and Natural Resources of Ukraine, Budget Institution "National Center for GHG Emission Inventory". Retrieved from https://mepr.gov.ua/wp-content/uploads/2023/03/Kadastr 2023.pdf.

Vazyanau, A. (2024). Ageing together: the symbiosis of gendered elderly bodies and old vehicles in a Ukrainian city. *Eurasian Geography and Economics*, *65*(3), 346-370. https://doi.org/10.1080/15387216.2023.2197925.

Vehicles in use – Europe 2018. (2018). European Automobile Manufacturers' Association (ACEA). Retrieved from https://www.acea.auto/publication/report-vehicles-in-use-europe-2018/.

Vehicles in use – Europe 2021. (2021). European Automobile Manufacturers' Association (ACEA). Retrieved from https://www.acea.auto/publication/report-vehicles-in-use-europe-january-2021/.

Vehicles in use – Europe 2022. (2022). European Automobile Manufacturers' Association (ACEA). Retrieved from https://www.acea.auto/publication/report-vehicles-in-use-europe-2022/.

Vieira, J., Poças Martins, J., Marques de Almeida, N., Patrício, H., & Gomes Morgado, J. (2022). Towards Resilient and Sustainable Rail and Road Networks: A Systematic Literature Review on Digital Twins. *Sustainability*, *14*(7060). https://doi.org/10.3390/su14127060.

Yannis, G., & Chaziris, A. (2022). Transport System and Infrastructure. *Transportation Research Procedia*, *60*, 6-11. https://doi.org/10.1016/j.trpro.2021.12.002.

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ORIGINAL PAPER

AN INTEGRATED MODEL OF FINTECH IMPLEMENTATION IN NIGERIAN MICROFINANCE COMPANIES

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JEL Classification: G21, G23, L21, M10, M12, M15, O33.

Key words: FinTech Implementation, Microfinance Companies, Integrated Model, Management, Nigeria.

Abstract

The purpose of this study is to develop an integrated conceptual model for FinTech implementation within Nigerian microfinance companies. Existing research has identified various determinants of FinTech adoption, yet these insights remain fragmented across technological, organizational, behavioural, and regulatory perspectives. This study addresses this gap by synthesizing these dimensions into a unified framework that explains how internal capabilities and external environmental factors interact to enable effective and sustainable FinTech transformation in the Nigerian microfinance. The study adopts a conceptual research design grounded in systematic synthesis and thematic integration of existing peer-reviewed empirical and theoretical studies published between 2016 and 2025. Using an inductive analytical procedure, key constructs and interrelationships were identified, categorized, and aligned to established theories. The study reveals that effective FinTech implementation depends on the alignment of technological readiness, organizational capability, leadership commitment, customer engagement, regulatory support, and financial motivation. The proposed framework provides a structured blueprint for strategic planning and sustainable digital transformation within microfinance companies.

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ZINTEGROWANY MODEL WDRAŻANIA FINTECH W NIGERYJSKICH FIRMACH ZAJMUJĄCYCH SIĘ MIKROFINANSAMI

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Kody JEL: G21, G23, L21, M10, M12, M15, O33.

Słowa kluczowe: wdrażanie FinTech, instytucje mikrofinansowe, zintegrowany model, zarządzanie, Nigeria.

Abstrakt

Celem niniejszego artykułu jest opracowanie zintegrowanego modelu koncepcyjnego wdrażania FinTech w nigeryjskich instytucjach mikrofinansowych. Dotychczasowe badania zidentyfikowały różne determinanty adopcji technologii FinTech, jednak uzyskane wnioski pozostają rozproszone w obrębie perspektyw technologicznych, organizacyjnych, behawioralnych i regulacyjnych. Niniejsze badanie wypełnia tę lukę, syntetyzując te wymiary w jednolite ramy teoretyczne, które wyjaśniają, w jaki sposób wewnętrzne zdolności oraz zewnętrzne czynniki środowiskowe współdziałają, umożliwiając skuteczną i zrównoważoną transformację FinTech w mikrofinansach w Nigerii. Badanie przyjmuje koncepcyjny projekt badawczy oparty na systematycznej syntezie i integracji tematycznej istniejących recenzowanych badań empirycznych i teoretycznych opublikowanych w latach 2016–2025. Z zastosowaniem indukcyjnej procedury analitycznej zidentyfikowano, skategoryzowano i powiązano kluczowe konstrukty oraz zależności, odnosząc je do ugruntowanych teorii. Wyniki badania ujawniają, że skuteczna implementacja FinTech zależy od spójności gotowości technologicznej, zdolności organizacyjnych, zaangażowania przywództwa, zaangażowania klientów, wsparcia regulacyjnego oraz motywacji finansowej. Proponowane ramy stanowią uporządkowany plan działania dla strategicznego planowania i zrównoważonej transformacji cyfrowej w instytucjach mikrofinansowych.

Introduction

The rapid diffusion of financial technologies (FinTech) has redefined how microfinance companies deliver services, transforming traditional processes into agile, data driven, and customer centric models (Aloulou *et al.*, 2024, p. 280-307). Across global contexts, FinTech adoption enhances operational efficiency, transparency, and financial inclusion through integrating innovations such as mobile banking, blockchain, digital lending, and artificial intelligence (Omowole *et al.*, 2024, p. 90-100). Such actions may be described as a local stabilization reached at the expense of global destabilization (Włodarczyk & Szturo, 2016, p. 177-188). Within the microfinance context, FinTech acts as a strategic enabler that enhances outreach to underserved populations while optimizing internal capabilities (Offiong *et al.*, 2024b, p. 562-581). However, the successful implementation of these technologies depends on multidimensional factors such as technological readiness, organizational culture, leadership commitment, and regulatory stability that interact to determine strategic outcomes (Offiong *et al.*, 2025a).

Studies have examined these determinants across different contexts. For instance, (Offiong *et al.*, 2025b) emphasized the role of FinTech as a catalyst for sustainable finance, integrating environmental, social, and governance (ESG) principles into financial innovation. Similarly, (Usman *et al.*, 2025) investigated the operational readiness and financial inclusion perspectives in Nigeria. While, (Ammar & Ahmed, 2016) explored user and organisation level perspectives.

In the Nigerian context, prior studies predominantly examine single determinants such as infrastructure, regulation, or customer perception in isolation yet, no study has jointly studied these determinants and translated them into an integrated, stepwise implementation framework for microfinance companies. This absence of an integrative, determinant driven implementation framework constrains adoption growth and managerial practice in the domain.

To address this gap, the present paper aims to develop a conceptual FinTech implementation framework that consolidates multi-level determinants identified in existing empirical studies into an integrated structure that reflects the dynamic realities of Nigeria's microfinance companies. This study seeks to answer the following **research question**: How can the key determinants of FinTech implementation, synthesized from existing studies, be integrated into a unified FinTech implementation framework for Nigerian microfinance companies? Therefore, the main goal of this study is to develop an integrated conceptual model for FinTech implementation within Nigerian microfinance companies.

This paper contributes to the growing body of FinTech and microfinance research through offering a unified conceptual model that integrates previously fragmented determinants into a robust implementation framework. It further provides strategic and managerial insights on operationalizing FinTech initiatives to enhance efficiency, inclusion, and sustainability.

The remainder of the paper is organized as follows. Section 2 presents a review of the relevant literature. Section 3 methodology, Section 4 develops and presents the proposed integrated FinTech implementation framework. Section 5 discussion and Section 6 concludes the paper.

Literature Review

Determinants of FinTech Implementation in Nigerian Microfinance companies

The implementation of financial technology within Nigerian microfinance companies represents a multidimensional transformation that extends beyond technological adoption to encompass organizational strategy, human capacity, and regulatory collaboration. Evidence from (Offiong *et al.*, 2025c) highlights that FinTech diffusion in microfinance is primarily driven by operational efficiency, improved customer experience through AI-enabled personalization,

and the strategic mission of financial inclusion. These elements position FinTech as both a technological and managerial innovation for improving transparency and competitiveness. Expanding on earlier work, (Offiong *et al.*, 2023, p. 169-177) revealed that successful FinTech implementation depends on internal organizational readiness, leadership commitment, innovation culture, and resource capacity, combined with external enablers such as regulatory frameworks and digital infrastructure. This dual perspective corresponds with the Technology--Organization-Environment (TOE) framework, demonstrating that FinTech adoption is contingent on balancing internal capabilities with environmental opportunities (DiMaggio & Powell, 1983, p. 147-160).

The technological dimension of FinTech transformation is further elaborated in (Offiong *et al.*, 2024c), which found blockchain, digital lending, and mobile banking as the most influential innovations in improving efficiency, accountability, and inclusion. In a related study, (Offiong *et al.*, 2025b) established that employee training, customer trust, and communication quality are pivotal in ensuring successful implementation. From the customer side, (Usman *et al.*, 2024) confirmed that mobile payments and digital wallets significantly enhance both financial inclusion and operational resilience, although firm size and managerial education moderate these benefits. Meanwhile, (Agboola *et al.*, 2023, p. 1-13) demonstrated that FinTech lending and asset financing substantially improve micro-enterprise survival and sales revenue, offering strong evidence of FinTech's economic rationale. In examining behavioural determinants, (Ammar & Ahmed, 2016) found that perceived usefulness, ease of use, credibility, and awareness strongly predict user adoption of FinTech tools, reinforcing the role of trust and digital literacy. Complementary findings in (Hasan *et al.*, 2024) established that financial literacy mediates the relationship between FinTech adoption and microfinance outcomes, highlighting the central role of education and informed decision-making.

Implementation Strategies and Organizational Impacts

Microfinance can realize the transformative impacts of FinTech implementation only when it is embedded within coherent strategies that align technology with leadership vision, governance structures, and a culture of innovation; (Offiong *et al.*, 2024a, p. 802-810) observed that most FinTech microfinance research emphasizes quantitative evidence connecting adoption with financial inclusion, efficiency, and sustainability. This underscores the importance of methodologically grounded approaches for measuring managerial effectiveness and digital transformation outcomes. Addressing the sustainability dimension, (Offiong *et al.*, 2025a, p. 1-13) demonstrated that FinTech supports sustainability when embedded within ethical governance and ESG-integrated management systems.

At the operational level (Halidu *et al.*, 2025) found that mobile banking and point-of-sale services are the strongest contributors to financial inclusion in Nigeria, emphasizing that customer focused innovation remains central to implementation success. FinTech integration also enhances resilience and inclusion through improved communication and innovation culture. As reported in (Edo *et al.*, 2023), customer awareness, security perception, and affordability determine sustained digital adoption, particularly during crisis conditions. Aligned with these findings (Ghodke *et al.*, 2025, p. 102-121) demonstrated that literacy inclusive, human centered design, characterized by simplicity, local language use, and participatory co design, enhances trust and adoption among low literacy users.

At the strategic level, (Offiong *et al.*, 2025c) revealed that the synergy of technological readiness, financial motivation, and regulatory trust predicts successful implementation. Leadership commitment and adaptive learning are essential for achieving digital maturity a conclusion consistent with (Lawal & Abdulkadir, 2023, p. 10-23) which highlighted that flexible, collaborative regulation promotes innovation, trust, and investment, linking digital transformation to inclusive economic growth.

Methodology

Research Design

This study adopts a conceptual research design based on the synthesis of prior empirical and theoretical studies related to FinTech adoption and digital transformation in microfinance. The purpose of this approach is to consolidate dispersed knowledge and develop an integrated conceptual framework for FinTech implementation in Nigerian microfinance companies. The design follows a qualitative, theory-building orientation that emphasizes pattern recognition, thematic integration, and conceptual generalization from secondary sources (Offiong & Szopik-Depczyńska, 2024a, p. 802-810).

Data Sources and Selection Criteria

The study draws on a carefully curated body of peer-reviewed literature covering FinTech adoption, innovation, and organizational change in the microfinance domain. The data set consists of the eighteen published studies compiled in the reference document, encompassing both global and Nigeria-specific contexts between 2016 and 2025. To ensure methodological rigor, inclusion criteria were established to guide article selection. Each study examined FinTech adoption, implementation, or innovation within microfinance or closely related financial inclusion settings.

Analytical Approach

The analytical process followed three systematic stages designed to generate a contextually grounded conceptual framework. In the first stage, each article was examined in detail to identify major constructs, determinants, and outcomes associated with FinTech implementation. In the second stage, the extracted data were organized into higher order categories through inductive thematic analysis. The third stage involved integrating the thematic categories into a single conceptual framework representing the FinTech implementation process in Nigerian microfinance companies. Conceptual reliability was strengthened through cross verification of constructs and relationships across multiple independent studies.

Development of the Conceptual Framework

Identification and Definition of Constructs

The conceptual framework is anchored on seven interrelated constructs that collectively explain how organizations adapt, innovate, and sustain digital transformation. These constructs are grounded in established theories such as the Technology Organization Environment framework (Dwivedi *et al.*, 2012, p. 461), the Resource Based View (Barney, 1991, p. 99-120), Dynamic Capabilities Theory (Teece, 2018), Institutional Theory (DiMaggio & Powell, 1983, p. 147-160), and Innovation Diffusion Theory (Turner, 2007, p. 776). Technological readiness represents an organization's ability to acquire and effectively use digital tools for service delivery and operational improvement.

Table 1 summarises the main determinants of FinTech implementation identified across the eighteen reviewed studies. Organisational capability and technological readiness appear most frequently, underscoring their importance for effective adoption. Stakeholder engagement and communication quality also feature prominently. Regulatory clarity is the most context specific determinant, reflecting its influence on managerial decision-making.

Moreover, organizational capability refers to the internal competencies, culture, and managerial resources that transform technological potential into strategic advantage. It reflects learning capacity, teamwork, and innovation orientation that strengthen adaptability and responsiveness to technological and market change (Kurniasari *et al.*, 2025). Leadership commitment builds on this through providing vision, guidance, and governance needed to legitimize and sustain FinTech initiatives. Leaders shape culture, allocate resources, and establish trust, ensuring that digital transformation aligns with strategic goals and ethical standards (Musaigwa & Kalitanyi, 2023, p. 20-27). Furthermore,

Table 1

Structured Synthesis of Determinants of FinTech Implementation

Study Scope	Determinant(s)	Dimensions (T/O/B/F/R)	Frequency Across 18 Articles	Context-Specific/ Transferable
Digital Infrastructure Development	Technological Readiness	Technological	10	Transferable
Internal Change Adaptation	Organisational Capability	Organizational	12	Transferable
User-Centred Interaction	Stakeholder Engagement	Behavioural/ Organisational	9	Transferrable/ context-specific
Adaptive Policy Support	Regulatory Clarity	Regulatory	7	Highly context-specific
Performance-Oriented Investment	Financial Motivation	Organizational / Financial	6	Transferable
Trust-Building Communication	Communication Quality	Behavioural	5	Transferrable

Source: own elaboration.

customer engagement captures how organizations involve clients in co creating digital experiences. It emphasizes transparency, trust, and inclusivity, allowing low-income users to participate in technology enabled financial services. Engaged customers enhance innovation outcomes, offering feedback that informs design and service improvement (Offiong *et al.*, 2023, p. 169-177). At a broader level, the regulatory environment defines the structural context that legitimizes or constrains innovation. It involves clear and adaptive policies, compliance structures, and oversight mechanisms that promote confidence and collaboration between FinTech firms, regulators, and clients. Financial motivation represents the managerial rationale for technology investment. It embodies profitability, efficiency, and competitive logic that influence adoption and scale. When balanced with social and developmental goals, financial motivation ensures sustainable innovation (Offiong *et al.*, 2025c).

Proposed Integrative Framework

The FinTech Implementation framework for Nigerian Microfinance Companies provides a strategic guide for managers and decision makers to plan, implement, and sustain FinTech adoption in a structured and adaptive manner. The framework consists of six interlinked stages that integrate micro, meso, and macro perspectives. Each stage represents a critical phase in the implementation process and is supported through theoretical and empirical foundations.

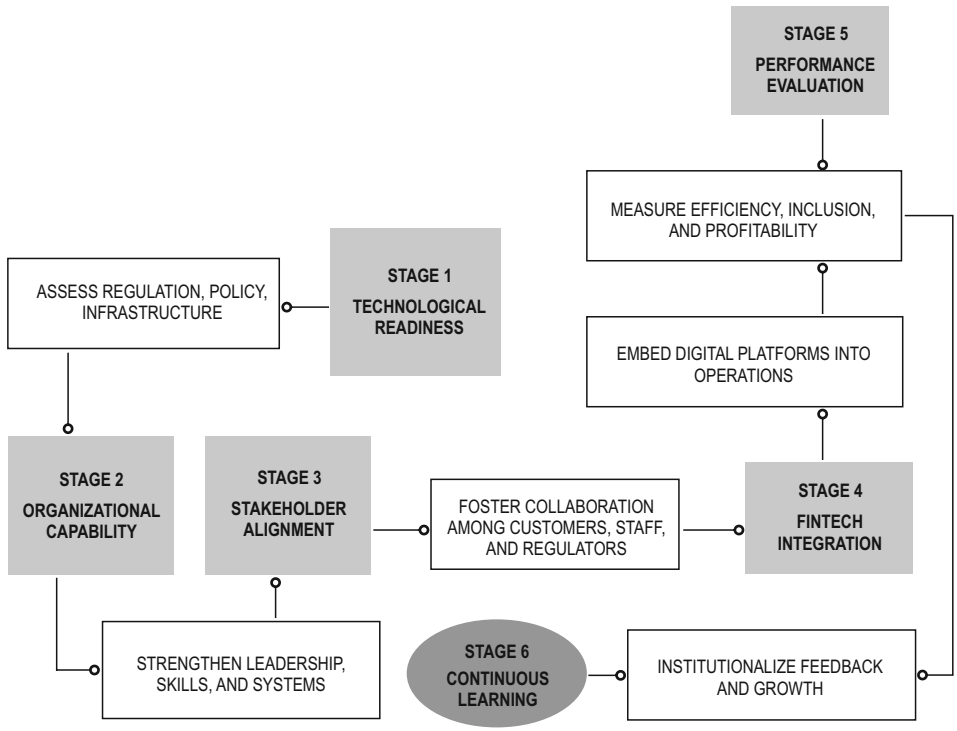

Fig. 1. FinTech Implementation Framework for Nigerian Microfinance Companies
Source: own elaboration.

The relationships among the six stages demonstrate how FinTech implementation unfolds through the interaction of external, organizational, and human factors. At the macro level, Stage 1 establishes the environmental and technological conditions that define feasibility. Regulatory clarity, technological infrastructure, and compliance trust create a stable foundation for innovation. The Technology Organization Environment and Institutional frameworks explain that readiness at this level legitimizes organizational action and reduces uncertainty, making subsequent internal adjustments more effective.

Furthermore, Stage 2 and Stage 3 represent the organizational and relational dimensions of implementation. Leadership commitment and employee capability mediate the relationship between external enablers and implementation outcomes. Through the Resource-Based View and Dynamic Capabilities perspectives, these stages illustrate how internal competencies transform external opportunities into strategic advantage. The co-creation and engagement mechanisms embedded in Stage 3 strengthen trust and knowledge exchange across the ecosystem, linking customer expectations and regulatory collaboration to improved adoption outcomes.

Stage 4 operationalizes the integration of digital systems and business processes. It serves as the convergence point where technological readiness meets organizational capability. The Innovation Diffusion framework supports this interaction through explaining that successful integration depends on perceived usefulness and compatibility with organizational culture. Managers who align new technologies with existing workflows enhance adoption efficiency and reduce employee resistance.

Moreover, Stage 5 and Stage 6 demonstrate the feedback and sustainability mechanisms essential for continuous improvement. Financial motivation moderates the relationship between organizational capability and performance outcomes. Profitability and efficiency indicators guide managerial decision making and resource allocation. The evaluation process feeds directly into Stage 6, where learning and adaptation close the implementation loop. Through dynamic capabilities, organizations renew their resources, refine processes, and sustain digital transformation over time.

The FinTech Implementation framework integrates empirical evidence with established theories to create a structured yet adaptive guide for microfinance companies. It connects environmental readiness, internal capability, stakeholder collaboration, and continuous learning into a coherent process that promotes innovation, inclusion, and sustainability. The implementation framework serves as a practical managerial tool, enabling Nigerian microfinance companies to navigate the complexities of FinTech transformation with strategic clarity and long-term vision.

Discussion and Implications

The stages of the framework align with contemporary research yet extends it through its systematic integration of environmental readiness, organizational learning, and stakeholder engagement. For instance, (Lawal & Abdulkadir, 2023, p. 10-23) emphasized that regulatory adaptability is critical for digital inclusion; however, the present model expands this understanding through positioning the regulatory environment as a dynamic moderator that legitimizes and stabilizes innovation across implementation stages. Similarly, (Thu, 2024) and (Usman *et al.*, 2025) demonstrated that FinTech adoption enhances inclusion and resilience, but their focus remained on macroeconomic outcomes. The current framework bridges this gap, showing how such outcomes depend on organizational capability and leadership commitment, translating macro-level insights into actionable strategies at the enterprise level.

In contrast to earlier technology-cantered frameworks such as the Technology Acceptance Model and Diffusion of Innovation Theory (Okoli & Tewari, 2021), which emphasize user perception, the proposed model embeds behavioural

elements within a broader organizational context. It draws on the Resource-Based View (Barney, 1991, p. 99-120) and Dynamic Capabilities Theory (Teece, 2018) to conceptualize FinTech adoption as a process of capability renewal and strategic adaptation.

Theoretically, the model integrates micro, meso, and macro dimensions into a single adaptive system linking environmental enablers to organizational transformation and inclusive growth. Practically, it provides a blueprint for aligning regulatory compliance, digital literacy, and customer engagement into a coherent strategy for technological modernization. Policymakers can apply its insights to strengthen collaborative governance and regulatory trust.

Conclusion, limitations and growth prospect

This study develops an integrated model that explains how FinTech implementation unfolds in microfinance companies through the interaction of technological readiness, organizational capability, leadership commitment, customer engagement, regulatory environment, and financial motivation. The findings reveal that FinTech adoption is a strategic process rooted in capability building, governance alignment, and adaptive learning, drawing on the Technology Organization Environment framework, Resource-Based View, Dynamic Capabilities Theory, and Institutional Theory.

Despite these theoretical advances, several limitations arise from the propositions formulated in the conceptual model. The proposed mediating and moderating relationships, such as the mediating role of organizational capability between technological readiness and sustainability outcomes, and the moderating effects of the regulatory environment and financial motivation, remain conceptual and require empirical validation. This limits the ability to test the strength and direction of these causal relationships across different organizational contexts. Future research should therefore validate these propositions empirically through multi level designs that capture dynamic interactions, capability evolution, and learning processes over time. This study also does not examine Nigeria's broader economic context for micro enterprises, which remains an important limitation requiring future empirical investigation.

The growth prospect of this study lies in its potential to guide both academic inquiry and managerial innovation. The proposed model serves as a strategic blueprint for microfinance companies seeking to deepen digital inclusion and resilience through structured capability building and adaptive governance. It also opens pathways for developing scalable, context-sensitive FinTech strategies that integrate ethical governance, customer co-creation, and sustainable financial performance.

Translated by Author

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References

Agboola, O., Adelugba, I.A., & Eze, B.U. (2023). Effect of Financial Technology on the Survival of Micro-Enterprises. *International Journal of Entrepreneurial Knowledge*, *11*(1), 1-13. https://doi.org/10.37335/ijek.v11i1.188.

Aloulou, M., Grati, R., Al-Qudah, A.A., & Al-Okaily, M. (2024). Does FinTech adoption increase the diffusion rate of digital financial inclusion? A study of the banking industry sector. *Journal of Financial Reporting and Accounting*, *22*(2), 289-307. https://doi.org/10.1108/JFRA-05-2023-0224.

Ammar, A., & Ahmed, E.M. (2016). Factors influencing Sudanese microfinance intention to adopt mobile banking. *Cogent Business and Management*, *3*(1), 1154257. https://doi.org/10.1080/23311975.2016.1154257.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99-120. https://doi.org/10.1177/014920639101700108.

DiMaggio, P.J., & Powell, W.W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, *48*(2), 147-160. https://doi.org/10.2307/2095101.

Dwivedi, Y.K., Wade, M.R., & Schneberger, S.L. (2012). Informations Systems Theory: Vol. 2. *Springer*, *28*(461). https://doi.org/10.1007/978-1-4419-6108-2.

Edo, O.C., Etu, E.E., Tenebe, I., Oladele, O.S., Edo, S., Diekola, O.A., & Emakhu, J. (2023). Fintech adoption dynamics in a pandemic: An experience from some financial institutions in Nigeria during COVID-19 using machine learning approach. *Cogent Business and Management*, *10*(2). https://doi.org/10.1080/23311975.2023.2242985.

Ghodke, P., Katoch, S., Tarwal, S., Bedekar, P.P., Murthy, D.N., & Kaiwade, A. (2025). Best Practice Synthesis for Designing Literacy Inclusive Digital Financial Products in Microfinance Contexts. *Enterprise Development and Microfinance*, *35*(1), 102-121. https://doi.org/10.3362/1755-1986.25-00006.

Hasan, N., Nanda, S., Agarwal, M.K., & Debnath, S.K. (2024). Evaluating the mediating effect of financial literacy between fintech adoption in microfinance services. *International Journal of System Assurance Engineering and Management*. https://doi.org/10.1007/s13198-024-02256-4.

Kurniasari, F., Abd Hamid, N., & Lestari, E.D. (2025). Unraveling the impact of financial literacy, financial technology adoption, and access to finance on small medium enterprises business performance and sustainability: a serial mediation model. *Cogent Business and Management*, *12*(1), 2487837. https://doi.org/10.1080/23311975.2025.2487837.

Lawal, A.B., & Abdulkadir, J. (2023). Developing a Sustainable Financial Model for Inclusive Growth in Nigeria: Integrating Fintech Innovation and Regulatory Frameworks. *Minhaj International Journal of Economics and Organization Science*, *3*(1), 10-23. https://doi.org/10.58932/mule0010.

Musaigwa, M., & Kalitanyi, V. (2023). Examining the leadership approaches adopted by Fintech management when implementing organizational change prompted by digital transformation. *Technology Audit and Production Reserves*, *4*(72), 20-27. https://doi.org/10.15587/2706-5448.2023.286627.

Offiong, U.P., Ioppolo, G., & Singh, G.A. (2023). The Determinants of Fintech Implementation in Microfinance Companies – A Systematic Literature Review. *Organization Review*, *4*(999), 169-177. https://doi.org/10.33141/po.2023.04.17.

Offiong, U.P., & Szopik-Depczyńska, K. (2024a). Analysing FinTech in Microfinance: Methodological frameworks and review Analysing FinTech in Microfinance: Methodological approaches frameworks

and review of research approaches. *Procedia Computer Science*, *246*, 802-810. https://doi.org/10.1016/j.procs.2024.09.499.

Offiong, U.P., Szopik-Depczyńska, K., Cheba, K., & Ioppolo, G. (2024b). FinTech as a digital innovation in microfinance companies – systematic literature review. *European Journal of Innovation Management*, *27*(9), 562-581. https://doi.org/10.1108/EJIM-04-2024-0462.

Offiong, U.P., & Szopik-Depczyńska, K. (2024c). Exploring the Spectrum of FinTech Innovations Implemented in Microfinance Companies: A Comprehensive Review (Unpublished doctoral dissertation). Szczecin: Univesity of Szczecin.

Offiong, U.P., Szopik-Depczyńska, K., & Cheba, K. (2025a). Determinants of FinTech Implementation in Nigerian Microfinance Companies: Insights from Employees, Customers, and Organizational Factor (Unpublished doctoral dissertation). Szczecin: Univesity of Szczecin.

Offiong, U.P., Ioppolo, G., & Szopik-Depczyńska, K. (2025b). *FinTech Innovations for Sustainable Development : A Comprehensive Literature Review and Future Directions*. 1-13. https://doi.org/10.1002/sd.70068.

Offiong, U.P., Szopik-Depczyńska, K., & Cheba, K. (2025c). Regulatory, Technological, and Financial Drivers of FinTech Integration in Microfinance Institutions: Evidence from Nigeria (Unpublished doctoral dissertation). Szczecin: Univesity of Szczecin.

Okoli, T.T., & Tewari, D.D. (2021). Does the adoption process of financial technology in africa follow an inverted U-shaped hypothesis? An evaluation of rogers diffusion of innovation theory. *Asian Academy of Management Journal of Accounting and Finance*, *17*(1), 281-305. https://doi.org/10.21315/aamjaf2021.17.1.10.

Omowole, B.M., Urefe,O., Mokogwu, C., & Ewim, S.E. (2024). Integrating fintech and innovation in microfinance: Transforming credit accessibility for small businesses. *International Journal of Frontline Research and Reviews*, *3*(1), 90-100. https://doi.org/10.56355/ijfrr.2024.3.1.0032.

Teece, D.J. (2018). Dynamic capabilities as (workable) management systems theory. *Journal of Management and Organization*, *24*(3), 359-368. https://doi.org/10.1017/jmo.2017.75.

Thu, Y. (2024). Impact of Cryptocurrency Adoption on Financial Inclusion in Myanmar. *Asian Journal of Computing and Engineering Technology*, *5*(2), 11-22. https://doi.org/10.47604/ajcet.2904.

Turner, R.J. (2007). Diffusion of innovations theory. *Journal of Minimally Invasive Gynecology*, *14*(6), 776. https://doi.org/10.1016/j.jmig.2007.07.001.

Usman, A.Y., Halidu, S.I., & Mohammad, S.W. (2025). Impact of Fintech Adoption on Operational Resilience and Financial Inclusion Among Small and Medium Enterprises in Nigeria's Informal Sector. *International Journal of Multidisciplinary and Innovative Research*, *2*(5), 140-149. https://doi.org/10.58806/ijmir.2025.v2i5n02.

Usman, N., Griffiths, M., & Alam, A. (2024). FinTech and money laundering: moderating effect of financial regulations and financial literacy. *Digital Policy, Regulation and Governance*, *27*(3), 301-326. https://doi.org/10.1108/DPRG-04-2024-0068.

Włodarczyk, B., & Szturo, M. (2016). Identification and Monitoring of Instability in Financial Systems. *Olsztyn Economic Journal*, *11*(2), 177-188. https://doi.org/10.31648/oej.2919.

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ORIGINAL PAPER

THE ROLE OF SUSTAINABILITY REPORTING IN THE DISCLOSURE OF NON-FINANCIAL ESG INFORMATION: A CASE STUDY OF A CONSTRUCTION COMPANY

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K e y w o r d s: sustainability development, non-financial reporting, construction industry.

A b s t r a c t

Sustainable development has become a key paradigm of modern management, reflected both in corporate strategies and in reporting practices. The aim of the article is to discuss the concept, origins, and essence of ESG reporting, analyse EU and national regulations, and evaluate the 2024 sustainability report of Budimex Group. The company was selected based on the *Build the Future* ranking, carried out by *Builder* magazine, PwC Poland, and Dun & Bradstreet Poland, in which Budimex ranked first among general contractors. The study focused on environmental, social, and corporate governance disclosures. The analysis leads to the conclusion that the Budimex Group's ESG report serves primarily an informational function, while its analytical potential could be strengthened by a stronger link between indicators and measurable, realistic and verifiable strategic goals, which would enable a reliable assessment of the effectiveness of ESG activities. The research was based on a qualitative method – a case study.

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ROLA SPRAWOZDAWCZOŚCI ZRÓWNOWAŻONEGO ROZWOJU W UJAWNIANIU INFORMACJI NIEFINANSOWYCH Z ZAKRESU ESG NA PRZYKŁADZIE PRZEDSIĘBIORSTWA BUDOWLANEGO

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S ł o w a k l u c z o w e: zrównoważony rozwój, sprawozdawczość pozafinansowa, branża budowlana.

A b s t r a k t

Zrównoważony rozwój stanowi obecnie kluczowy paradygmat zarządzania, odzwierciedlany zarówno w strategiach przedsiębiorstw, jak i w ich raportowaniu. Celem artykułu jest omówienie pojęcia, genezy i istoty raportowania kwestii ESG, analiza regulacji unijnych i krajowych oraz ocena sprawozdania zrównoważonego rozwoju Grupy Budimex za 2024 r. Wybór spółki oparto na rankingu realizowanego w ramach projektu „Build the Future" przez miesięcznik „Builder", PwC Polska i Dun & Bradstreet Poland, w którym Budimex zajął pierwsze miejsce wśród generalnych wykonawców. Badanie koncentrowało się na ujawnieniach środowiskowych, społecznych i dotyczących ładu korporacyjnego. Przeprowadzona analiza doprowadza do wniosku, że raport ESG Grupy Budimex pełni przede wszystkim funkcję informacyjną, natomiast jego potencjał analityczny mógłby zostać wzmocniony poprzez silniejsze powiązanie wskaźników z mierzalnymi, realistycznymi i weryfikowalnymi celami strategicznymi, co umożliwiłoby rzetelną ocenę skuteczności działań ESG. Podstawą badania była metoda jakościowa – studium przypadku.

Introduction

The modern economy faces growing challenges related to the need for sustainable development, which encompasses economic, environmental and social aspects. This concept is a response to the negative effects of the dynamic economic growth observed since the mid-20th century, such as environmental degradation, overexploitation of natural resources and increasing social inequalities. As a result, sustainable development has become one of the areas subject to reporting, which allows for increased transparency of companies (Di Tullio *et al*., 2025, p. 1). Organisations are facing increasing pressure to be transparent about their performance and to take responsibility for their impact on society and the environment (Zaporowska & Szczepański, 2024, p. 1).

The aim of this study is to provide an empirical analysis of sustainability reporting using the example of the Budimex Capital Group, which is a case study of a company reporting on environmental, social and corporate governance issues. The study also focuses on discussing the origins and concepts of sustainable development, presenting the essence and legal framework of ESG reporting

in the light of EU directives (NFRD and CSRD). The research method used is a case study, which allows for an in-depth analysis of a selected economic entity. This approach allows us to show the structure, information content and practical significance of the sustainability report in the context of assessing the company's operations. The choice of the Budimex Capital Group as the subject of the study results from its leading position on the construction market in Poland according to the ranking carried out as part of the "Build the Future" project by the monthly magazine "Builder", PwC Polska and Dun & Bradstreet Poland. Bradstreet Poland. The analysis covered the sustainability report that is part of the Budimex Capital Group's report on its activities for 2024.

Sustainable development – origins and concept

The idea of sustainable development began to take shape as a response to growing concerns about the negative effects of rapid economic growth in Western countries. Attention was drawn to problems such as the overexploitation of non-renewable natural resources, environmental degradation, rapid population growth, widening inequalities between wealthy countries and the rest of the world struggling with hunger and poverty, and the destabilisation of ecosystems (Płachciak, 2011, p. 231). The term "sustainable development" was probably introduced by British economist and journalist Barbara Warda in the 1960s. Warda emphasised the importance of environmental issues in the context of development and called on Western countries to share their prosperity with poorer countries (Nakonieczna-Bartosiewicz, 2022, p. 17). The United Nations Organization has played an important role in putting forward environmental issues (Raczkowska *et al*., 2021, p. 9). In 1983, the UNO established the World Commission on Environment and Development (the Brundtland Commission), which published the report *"Our Common Future"* in 1987. It defined sustainable development as development that meets the needs of present societies without compromising the ability of future generations to meet their own needs. This concept has been widely accepted around the world (Burchard-Dziubińska *et al*., 2014, p. 15). The idea of sustainable development requires a holistic approach that takes into account diverse perspectives and many areas of life and science (Sztumski, 2019, p. 9). As some researchers point out, this concept should be analysed in relation to specific systems and areas in which it has practical application (Zacher, 2016, p. 66). After analysing many definitions of sustainable development, K. Gadomska-Lila and J. Wasilewicz concluded that several common elements can be identified, i.e. the concept of sustainable development refers to three main areas: economic, environmental and social; it integrates human activities with the preservation of natural balance; it is an intergenerational initiative; it assumes a long-term perspective; it serves to meet

the needs of people around the world (Gadomska-Lila *et al*., 2016, p. 302, 303). In order to ensure the transparency and accountability of organisations in matters related to sustainable development, the information included in sustainable development reporting will play an important role.

ESG reporting – essence and legal regulations

Sustainability reporting, also referred to as non-financial reporting or ESG (*Environmental*, *Social*, and *Corporate Governance*) reporting, according to the Global Reporting Initiative (GRI)[1], refers to the process of measuring, disclosing and communicating responsibly with stakeholders – both internal and external – about the effects and effectiveness of actions taken in the areas of environment, society and corporate governance (Kowalczyk & Kowalczyk, 2015, p. 107). This data is presented either mandatorily or voluntarily alongside the financial statements as part of the company's annual report, showing its impact on society and the natural environment (Mazurowska & Płoska, 2022, p. 77). This report discloses non-financial risks, supplementing the shortcomings of traditional financial reporting, which allows for the reduction of information asymmetry in social and environmental areas between the company and its environment (Sadowski, 2023, p. 156). However, the disclosure of non-financial information by companies has its advantages and disadvantages, which are outlined in Table 1.

Table 1

Advantages and disadvantages of non-financial reporting

Advantages	Disadvantages
– innovative solution – provides more information to stakeholders – increased transparency of information provided	– overly detailed requirements for non-financial information may adversely affect a company's privacy policy, including disclosure of its model and operating specifications – penalties for failure to disclose non-financial information in annual reports

Source: Koper & Kubicka (2024, p. 26).

The European Commission, considering the fact that voluntary disclosure of social and environmental data did not bring satisfactory results, considered improving the process of publishing this type of information to be one of its priority areas of action (Kowalczyk & Kowalczyk, 2015, p. 109). The obligation to report on sustainable development gained importance after the European

[1] The Global Reporting Initiative (GRI) is a network organisation that pioneered the development of sustainability reporting frameworks and is committed to their continuous improvement and global application.

Union adopted Directive 2014/95/EU of 22 October 2014 on the disclosure of non-financial information (Non-Financial Reporting Directive, NFRD) (Kamiński, 2023, p. 233). Subsequently, the need to change the method and scope of reporting was recognised, resulting in the adoption of Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU as regards corporate sustainability reporting (Corporate Sustainability Reporting Directive, CSRD) (Czech & Nazarko, 2024, p. 2, 3). This directive requires companies to disclose more information about their activities, environmental and climate impact, including business models, strategies and supply chains. It introduces uniform ESRS standards and expands the scope of entities covered by sustainability reporting, as shown in Table 2 (Świderska & Krysik, 2023, p. 9).

Table 2

Schedule for entry into force of the CSRD

	Entities subject to the NFRD	Large entities	Small and medium- sized entities listed on a regulated market in the EU	Entities outside the EU
Criteria	Large public-interest entities or parent entities of large groups: – balance sheet total of EUR 20 million – net turnover of EUR 40 million – number of employees > 500	Meeting 2 out of 3 criteria: – balance sheet total of EUR 20 million – net turnover of EUR 40 million – number of employees > 250	Meeting 2 of the 3 criteria: – balance sheet total of EUR 350,000 – net turnover EUR 700,000 number of employees > 10	Non-EU entities: – net turnover in the EU > EUR 150 million – with a branch in the EU with a net turnover > EUR 40 million – or an EU subsidiary subject to CSRD
Date of entry into force	in 2025 for the 2024 financial year	In 2026 for the 2025 financial year	In 2027 for the 2026 financial year	In 2029 for the 2028 financial year

Source: Owczarska (2024).

An important aspect of Directive 2022/2464 is the introduction of mandatory certification of sustainability reporting. ESG information is to be verified by a certified auditor, an audit firm – if a given Member State adopts this option – or a so-called independent assurance provider (Małkowska & Walczak, 2023, p. 160). Consistent rules for reporting certification will be key to ensuring the reliability of information disclosed by entities covered by the directive (Widera, 2024, p. 149).

In line with EU standards, Polish accounting law has been extended to include provisions on sustainable development reporting. From 1 January 2025, Chapter 6c of Ustawa o Rachunkowości z dnia 29 września 1994 roku (Articles 63p–63zd) will apply, specifying the subjective and objective scope of the reporting obligation in this area. At the same time, article 3(1) (1a–1e) updated the criteria for classifying micro and small enterprises and introduced separate criteria for medium-sized and large entities and large groups (Ustawa o Rachunkowości, 1994).

Methodology and research entity

Case studies are common in many scientific disciplines (Wohlin & Rainer, 2022, p. 3). A case study is a monographic method, i.e. one that focuses on an in-depth description and analysis of one (sometimes several) research objects. Case studies include descriptive reports presenting examples of a given phenomenon, descriptions of social policy measures, or analyses focusing on extreme or typical cases (Pizło, 2009, p. 247). The narrow focus on a single case serves an "explanatory" purpose by providing specific recommendations (Baldassarre, 2025, p. 2).

Due to the extensive nature of sustainability reports, the focus was on analysing one specific case to show the structure and information content of this type of report. The research entity was selected based on the ranking carried out as

Table 3

Largest general contractors in terms of sales revenue in 2023, including net profit (loss) and total assets

No.	Name	Province	Sales revenue (PLN million)	Net profit/loss (PLN million)	Total assets (PLN million)
1	Grupa Kapitałowa Budimex	mazowieckie	9802	746	8418
2	Strabag	mazowieckie	4896	78	3765
3	PORR	mazowieckie	4505	69	1952
4	Grupa Kapitałowa Mirbud	łódzkie	3322	135	2284
5	Grupa Kapitałowa Erbud	mazowieckie	3234	23	1974
6	Grupa Kapitałowa Polimex Mostostal	mazowieckie	3014	123	2429
7	Grupa Kapitałowa Unibep	podlaskie	2430	-156	1807
8	Grupa Kapitałowa Trakcja	mazowieckie	2066	56	1489
9	Grupa Kapitałowa NDI	pomorskie	2037	25	1324
10	Grupa Kapitałowa Mostostal Warszawa	mazowieckie	1675	17	1229

Source: *Ranking Generalnych Wykonawców…* (2024).

part of the "Build the Future" project by the monthly magazine "Builder", PwC Poland and Dun & Bradstreet Poland, part of which is presented in Table 3.

Based on Table 3, it can be concluded that the Budimex Capital Group is the largest general contractor, as in 2023 the company achieved the highest sales revenue, net profit and total assets. The ranking also states that one of the most important trends that has gained significance is the growing interest in sustainable construction. Today, the construction sector has a significant impact on all three aspects of sustainable development: economic, environmental and social (Moshood *et al.*, 2024, p. 1). Therefore, it is an industry in which the activities of key companies that carry out some of the largest investments in the country should be verified, which translates into the scale of these companies' impact.

Case study – Budimex Capital Group

The Budimex Capital Group's sustainability report is an integral part of the company's activity report. In previous years, the parent company prepared integrated reports in the form of separate studies[2]. The structure of the report for 2024 includes general information, environmental issues, social issues and corporate governance issues, as presented in Table 4.

Table 4

Structure and key information contained
in the Budimex Capital Group's Sustainability Report for 2024

Eneral information	Basis for preparing the report	The sustainability report has been prepared in accordance with Chapter 6c *of Ustawa o Rachunkowości z dnia 29 września 1994 roku* and is based on ESRS* standards. The report has been externally certified by the auditing firm Ernst & Young Audyt Polska Sp. z o.o. Sp. k.
	Conducting business activity	The governing bodies of Budimex SA, the parent company of the Budimex Group, are the General Meeting, the Supervisory Board and the Management Board. Women accounted for 16.7% of the Management Board and 22.2% of the Supervisory Board, and there are no representatives of employee organisations in the company's governing bodies.
	Sustainable development management	Sustainable development is a matter of interest to the Management Board and is subject to verification and supervision by the Supervisory Board. Within the Budimex Group, the ESG, Quality and Environmental Protection Office exercises comprehensive supervision over the implementation of ESG activities. The tasks of the Management Board members related to sustainable development and environmental impact affect their annual bonus of 25– 42%. The Budimex Group manages risk and exercises internal control over sustainability reporting.

[2] The integrated reports of the Budimex Capital Group are available on the website https:// budimex.pl/esg/raport- zrownowazonego-rozwoju/.

cont. Table 4

	Business model	The Budimex Group provides construction and assembly services as a general contractor in Poland and abroad (including Germany, Slovakia, the Czech Republic and Latvia), using its own mineral-asphalt mixes and steel prefabricated elements. It is also developing its activities in the areas of waste management, infrastructure maintenance, building maintenance, renewable energy sources and electromobility.
	Value chain	In the value chain, the Budimex Group distinguishes between the higher level (suppliers and resources necessary to provide services), its own activities and the lower level (public and private customers).
	Sustainable development strategy	An ESG Strategy for 2023–2026 with a perspective until 2050 has been developed. The strategy identifies 10 ESG objectives in the areas of the environment (combating climate change, closing the raw materials cycle, protecting resources), society (integration of generations, guarantee of safe and decent work, strengthening of relationships) and corporate governance (ethics, anti-corruption, conscious risk management, attention to cybersecurity).
	Significant impacts, risks and opportunities	A comprehensive assessment of ESG risks was conducted for the first time in 2023 in cooperation with an external consulting firm. ESG risks and opportunities were identified as part of a double materiality analysis. The materiality of actual and potential, positive and negative impacts of the Budimex Group's operations on its upstream and downstream value chain was determined. A time frame for individual impacts was also set.
Environment	Taxonomy	The Budimex Group uses taxonomic indicators based on turnover, capital expenditure (CAPEX) and operating expenditure (OPEX). Turnover from environmentally sustainable activities (in accordance with the taxonomy) accounts for 25.65% of total turnover. Capital expenditure on environmentally sustainable activities (in accordance with the taxonomy) accounts for 50.88% of CAPEX expenditure. Operating expenditure on environmentally sustainable activities (in accordance with the taxonomy) accounts for 0% of OPEX expenditure.
	Climate change	The Budimex Group has identified physical risks (including deterioration of working conditions and technological limitations due to rising temperatures, increased frequency of fires) and transitional risks (including increased costs resulting from carbon taxes and fees, rising energy and raw material prices).
	Pollution	The activities carried out have a negative impact on the environment and society, as they involve emissions of pollutants into the air and water and soil degradation. The presence of hazardous substances in building materials poses a risk to employees. Based on the identified environmental risks, the Budimex Group is developing an internal environmental protection plan.
	Water and marine resources	The investments being carried out have a negative impact on freshwater consumption and abstraction, which may lead to increased costs and the need to modify investment plans due to limited resources and water stress. In addition, the environment is burdened by excessive water discharges in relation to its abstraction.
	Biodiversity and ecosystems	Construction projects have a negative impact on the environment through habitat degradation, species loss and reduced soil biodiversity caused by using impermeable materials, which increases the risk of water runoff and flooding.
	Resource use and circular economy	The negative impact of projects on resource depletion and waste generation. The opportunity to reduce this impact through responsible resource management via circularity, recycling and recovery policies.

cont. Table 4

Society	Own human resources	The Budimex Group has both a negative (risk of accidents, occupational diseases, mobility burden) and positive (stable employment, training) impact on its employees by implementing its Health and Safety Policy and measures to combat discrimination and promote diversity. As of 31 December 2024, the Budimex Group employed 7,665 people, of whom 23.87% were women and 76.13% were men. The voluntary turnover rate in 2024 was 14.78%.
	People performing work in the value chain	After the end of cooperation, contractors are assessed in terms of quality, timeliness, technical potential, pricing conditions and, in the case of sub-contractors and equipment suppliers, compliance with health and safety and environmental protection requirements. In the value chain, the Budimex Group identifies both negative effects (risk of accidents, discrimination, extreme weather events) and positive effects (implementation of health and safety and ethical practices among suppliers).
	Affected communities	The Budimex Group may have a negative impact on local communities through noise, traffic disruptions, pollution and health and safety risks. In 2024, consultations were held in response to 386 complaints, resolving 318 conflicts, and the local media were informed about investments and disruptions before work commenced.
	Consumers and end users	The positive impact of investments on accessibility for consumers, while the risks include competition from foreign companies, the deteriorating economic situation, inflation and rising project costs.
Corporate governence	Business conduct	The Budimex Group operates transparently, in accordance with the law and ethical principles, applying fair practices in its relations with contractors. The compliance system minimises the risk of unethical behaviour, and in 2024 there were no violations of anti-corruption regulations.

*ESRS (European Sustainability Reporting Standards).

Source: own study based on the Sustainability Report, which is part of the Budimex Capital Group's 2024 Activity Report, available in the National Court Register.

The analysis of the Budimex Group's sustainability report indicates that the report meets legal requirements and ESRS standards and is characterized by a high level of completeness and transparency of disclosures. The scope of the presented quantitative and qualitative data is extensive, and its credibility has been reinforced by external assurance. Furthermore, the mandatory ESG reporting has revealed key opportunities and risks within the Budimex Group and enabled the identification of areas requiring the development of strategies to mitigate negative environmental and social impacts. At the same time, despite the extensive database of indicators, the report provides limited support for assessing the effectiveness of ESG activities. Many metrics are not directly linked to clearly defined targets, time horizons, or progress assessment criteria, making it difficult to interpret results in terms of effectiveness, rather than simply the scope of activities.

In the environmental area, the Budimex Group identifies key negative impacts, particularly in terms of pollutant emissions, consumption of natural resources, and impact on biodiversity. The inclusion of climate risk analysis

and the reporting of taxonomic indicators are positive. However, the high share of CAPEX classified as environmentally sustainable, coupled with a zero share of OPEX, raises doubts about the actual operational implementation of sustainable development principles, pointing to the investment-based rather than systemic nature of the actions undertaken.

In the social dimension, the report highlights both positive impacts, such as employment stability and employee competency development, and significant risks related to the nature of construction activities, including occupational health and safety hazards and the impact on local communities. Despite the presentation of quantitative data (including employment structure, employee turnover, and the number of social complaints), there is no reference to clearly defined goals and target thresholds, limiting the ability to assess progress over time.

In the area of corporate governance, there is a noticeable formal integration of ESG issues into the management system, including linking the implementation of environmental and social goals with the Management Board's remuneration system. However, the report does not provide sufficient information to assess the extent to which these mechanisms translate into measurable results in terms of ESG risk reduction or improved non-financial performance. The conducted analysis allows us to conclude that the Budimex Group's ESG report serves primarily an informational function, with positive and negative impacts described in parallel, without a clear net balance, while its analytical potential could be strengthened by a stronger link between indicators and measurable, realistic and verifiable strategic goals, which would enable a reliable assessment of the effectiveness of ESG activities.

Summary

The issue of sustainable development is gaining importance in the economy, as evidenced by the introduction of mandatory reporting on social, environmental, and corporate governance issues for individual companies in the coming years. Analysis of the case study suggests that ESG reporting provides a wealth of valuable information about a company's operations and is a valuable complement to the financial information presented in the core elements of financial statements, such as the balance sheet, profit and loss statement, cash flow statement, statement of changes in equity, and notes to the financial statements. Analysis of the sustainability report, which is subject to attestation, allows for obtaining reliable data on the positive and negative impacts of business operations. The analysis of the Budimex Group's ESG report leads to the conclusion that it is a significant complement to financial information, enabling a better understanding of both the positive and negative impacts of the company's operations. At the same time, the analysis indicates that despite its

extensive set of indicators and high-quality disclosures, the report provides limited support for assessing the effectiveness of the actions taken and their impact on the environment, society, and corporate governance. To enhance the report's usefulness for stakeholders, it is recommended to further develop the links between indicators and measurable, realistic, and verifiable strategic goals, as well as to include a synthetic net balance of positive and negative impacts. Implementing such changes would not only allow for a more accurate assessment of the effectiveness of ESG activities but also better support decision-making processes and monitor progress in implementing the sustainable development strategy.

Translated by Andżelika Drozd

References

Baldassarre, B. (2025). Circular economy for resource security in the European Union (EU): Case study, research framework, and future directions. *Ecological Economics*, *227*, 108345, 1-16. https://doi.org/10.1016/j.ecolecon.2024.108345.

Burchard-Dziubińska, M., Rzeńca, A. & Drzazga, D. (2014). *Zrównoważony rozwój – naturalny wybór*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego. http://dx.doi.org/10.18778/7969-090-9.

Czech, E., & Nazarko, N. (2024). Obowiązek raportowania w zakresie zrównoważonego rozwoju w kontekście ograniczenia prawa do informacji o środowisku i jego ochronie. *Prawne Problemy Górnictwa i Ochrony Środowiska*, *1*, 1-14. https://doi.org/10.31261/PPGOS.2024.01.06.

Di Tullio, P., La Torre, M., & Rea, M. (2025). Sustainability reporting regulation: hypes, myths and reflections. *Management Decision*. https://doi.org/10.1108/MD-10-2024-2462.

Gadomska-Lila, K., & Wasilewicz, J. (2016). Zrównoważony rozwój i społeczna odpowiedzialność z perspektywy biznesowej. *Studia i Prace WNEIZ US*, *46*(1), 299-310. https://doi.org/10.18276/sip.2016.46/1-23.

Kamiński, R. (2023). Raportowanie zrównoważonego rozwoju przedsiębiorstw w świetle regulacji Unii Europejskiej. In R. Kamiński (Ed.). *Koncepcja zrównoważonego rozwoju w ekonomii, finansach i zarządzaniu*. Poznań: Polskie Towarzystwo Ekonomiczne Oddział w Poznaniu.

Koper, M., & Kubicka, O. (2024). Sprawozdawczość niefinansowa w budowaniu wartości przedsiębiorstwa na przykładzie firmy KRUK S.A.. In I.E. Franczak, M. Iwan & P. Zemczak (Eds.), *Rachunkowość w dobie zrównoważonego rozwoju – wybrane zagadnienia*. Katowice: Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach. http://dx.doi.org/10.22367/uekat.9788378759294.

Kowalczyk, B., & Kowalczyk, W. (2015). Raportowanie kwestii zrównoważonego rozwoju oraz integrowanie danych finansowych i pozafinansowych – prawne uwarunkowania w Polsce i na świecie. *Ruch Prawniczy, Ekonomiczny i Socjologiczny*, *77*(4), 105-117. https://doi.org/10.14746/rpeis.2015.77.4.9.

Małkowska, R., & Walczak, M. (2023). Działania regulacyjne w rozwoju sprawozdawczości CSR jako sposób eliminacji greenwashingu. *Studia i Prace Kolegium Zarządzania i Finansów, 192*, 145-165. https://doi.org/10.33119/SIP.2023.192.8.

Mazurowska, M., & Płoska, R. (2022). Sprawozdawcza i pozasprawozdawcza komunikacja zewnętrzna w zakresie społecznej odpowiedzialności biznesu. *Centrum Myśli Strategicznych*. Retrieved from: https://www.researchgate.net/publication/359553246_Sprawozdawcza_i_pozasprawozdawcza_komunikacja_zewnetrzna_w_zakresie_spolecznej_odpowiedzialnosci_biznesu (14.11.2025).

Moshood, T.D., Rotimi, J.O., & Shahzad, W. (2024). Enhancing sustainability considerations in construction industry projects. *Environment Development and Sustainability*. https://doi.org/10.1007/s10668-024-04946-2.

Nakonieczna-Bartosiewicz, J. (2022). Zrównoważony rozwój – pojęcie i geneza. In A. Drosik, D. Heidrich & M. Ratajczak (Eds.). *Wprowadzenie do zrównoważonego rozwoju. Podręcznik akademicki*. Warszawa: Wydawnictwo Naukowe Scholar.

Owczarska, K. (2024). Raportowanie niefinansowe w Uniwersytecie Ekonomicznym we Wrocławiu – stan obecny i możliwości doskonalenia. In D. Teneta (Ed.). *Zrównoważony rozwój – trendy, wyzwania, kontrowersje*. Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.

Pizło, W. (2009). Studium przypadku jako metoda badawcze w naukach ekonomicznych. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*, *11*(5), 246-251.

Płachciak, A. (2011). Geneza idei rozwoju zrównoważonego. *Ekonomia, 5*(17), 231-248.

Raczkowska, M., Mikuła, A., & Utzig, M. (2021). *Zrównoważony rozwój w obszarze społecznym w Unii Europejskiej*. Warszawa: Wydawnictwo SGGW.

Ranking Generalnych Wykonawców realizowany w ramach projektu „Build the Future" przez miesięcznik „Builder". (2024). PwC Polska i Dun & Bradstreet Poland. Edycja VI. Część 3. Retrieved from: https://www.pwc.pl/pl/artykuly/ranking-najwiekszych-firm-budowlanych-w-polsce-build-the-future.html (14.11.2025 r.).

Sadowski, T. (2023). Raportowanie zrównoważonego rozwoju. Szanse i wyzwania nie tylko dla dużych przedsiębiorców. *Europejski Przegląd Prawa i Stosunków Międzynarodowych*, *3*(67), 153-166.

Świderska, G.K., & Krysik, M. (2023). Czy zmiany w odniesieniu do sprawozdawczości w zakresie zrównoważonego rozwoju, jakie wprowadziła Dyrektywa Parlamentu Europejskiego i Rady (UE) 2022/2464, wpłyną na rachunkowość? Przyczynek do dyskusji. *Kwartalnik Nauk o Przedsiębiorstwie*, *68*(2), 5-22. https://doi.org/10.33119/KNoP.2023.68.2.1.

Sztumski, W. (2019). Zrównoważony rozwój – zrównoważony człowiek (zewnętrzne i wewnętrzne uwarunkowania zrównoważonego rozwoju). *Eunomia – Rozwój Zrównoważony – Sustainable Development*, *2*(97), 7-16.

Ustawa o Rachunkowości z dnia 29 września 1994 r., Dz. U. 1994 Nr 121 poz. 591.

Widera, A. (2024). Raportowanie niefinansowe na przykładzie Grupy Kapitałowej PGE. In D. Teneta (Ed.), *Zrównoważony rozwój – trendy, wyzwania, kontrowersje. Wrocław:* Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu. https://doi.org/10.15611/2024.55.0.11.

Wohlin, C., & Rainer, A. (2022). Is it a case study? A critical analysis and guidance. *Journal of Systems and Software*, *192*, 111395, 1-15. https://doi.org/10.1016/j.jss.2022.111395.

Zacher, L. (2008). Trwały rozwój – utopia czy realna możliwość? *Problemy Ekorozwoju – Problems of Sustainable Development*, *3*(2), 63-68.

Zaporowska, Z., & Szczepański, M. (2024). The Application of Environmental, Social and Governance Standards in Operational Risk Management in SSC in Poland. *Sustainability*, *16*(2413), 1-25. https:// doi.org/10.3390/su16062413.

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