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## ANALYSIS OF OPPORTUNITIES FOR THE DEVELOPMENT OF ELECTROMOBILITY OF URBAN TRANSPORT ON THE TERRITORY OF PILA DISTRICT

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Key words: electromobility, mobility, urban transport, environmental protection.

### Abstract

In the transportation industry, electromobility has become an indisputable trend that is not going to go away any time soon. According to analyses of the industry's growth, all signs point to an increase in the number of electric automobiles, which will eventually supplant conventional combustion vehicles. One electric vehicle is now sold every 1,000 people in Poland, where they make up roughly 4.5% of total automobile sales. 20,253 units were sold in 2021, a 93% increase from the previous year (*Elektromobilność...*, 2022). The continued efforts of the world's leading economies to cut greenhouse gas emissions, which are hastening climate change, are unquestionably a significant element supporting this course.

The aim of this article is to analyse the potential for the development of electromobility in the urban transport sector in Pila County. However, the success of this analysis will be possible during a period of transition in a number of important spheres. On the basis of the analysis, it can be concluded that such a possibility exists, as cars and other vehicles powered by electricity are becoming an alternative to traditional combustion vehicles, also reducing emissions of pollutants harmful to the environment. On the other hand, however, there are public concerns about this possibility, due to fires in electric cars, among other things.

## ANALIZA MOŻLIWOŚCI ROZWOJU ELEKTROMOBILNOŚCI TRANSPORTU MIEJSKIEGO NA TERENIE POWIATU PILSKIEGO

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Słowa kluczowe: elektromobilność, mobilność, transport miejski, ochrona środowiska.

### Abstrakt

Elektromobilność w transporcie stanowi obecnie trend, który zapewne szybko nie zniknie z przestrzeni gospodarki światowej. Wszelkie wskaźniki odnoszące się do badań rozwoju tej gałęzi przemysłu pokazują, że liczba samochodów z napędem elektrycznym będzie wzrastała coraz szybciej, a z czasem ten typ pojazdów wyprze tradycyjne auta spalinowe. Przykładowo w Polsce auta elektryczne to około 4,5% wszystkich sprzedawanych aut i obecnie na 1000 mieszkańców przypada jeden taki samochód. W 2021 roku sprzedano 20 253 sztuk, czyli o 93% więcej niż w roku poprzednim (*Elektromobilność...*, 2022). Ważnym czynnikiem potwierdzającym tę drogę jest na pewno ciągle dążenie największych gospodarek świata do ograniczenia emisji gazów cieplarnianych, powodujących zbyt szybkie zmiany klimatu.

Celem projektu jest rozwój elektromobilności w sektorze transportu miejskiego na terenie powiatu pilskiego. Sukces tego przedsięwzięcia będzie jednak możliwy w momencie przeobrażeń w wielu istotnych sferach. Być może jest to odniesienie bardziej globalne, lecz rozwój wielu dziedzin sprzyjających elektromobilności na szczeblu krajowym będzie wpływał na przyspieszenie wprowadzania nowych rozwiązań na poziomie mikroregionalnym (samorządowym), czyli w naszym przypadku w transporcie miejskim na terenie powiatu pilskiego.

## Introduction

In the world of transportation, electromobility has become an indisputable trend that is not expected to go away any time soon. According to analyses of the industry's growth, all signs point to an increase in the number of electric automobiles, which will eventually supplant conventional combustion vehicles. One electric vehicle is now sold every 1,000 people in Poland, where they make up roughly 4.5% of total automobile sales. 20,253 units were sold in 2021, a 93% increase from the previous year (*Elektromobilność...*, 2022). The continuous efforts of the world's main economies to cut greenhouse gas emissions, which hasten climate change, are undoubtedly a significant element supporting this course.

The creation of a policy for electromobility is crucial. It would actually be more correct to use the word “electrotransport” and even more correct to speak of low-emission transport, but the term “electromobility” is now widely used in the literature (Altenburg *et al.*, 2016; Bartłomiejczyk & Kołacz, 2020; May, 2018; Pietrzak & Pietrzak, 2019) This issue has also been addressed by the following researchers (Połom & Wiśniewski, 2021; Wasik *et al.*, 2018; Yigitcanlar, 2022). By this, we mean all propulsion technologies that guarantee there are no emissions produced throughout the process of supplying the energy required to drive the vehicle, at least initially. Poland used 17% renewable energy in 2020, with the remainder coming from fossil fuels. In terms of statistics, Poland is leading the pack when it comes to the use of fossil fuels to generate power. Sweden, with just 2% of energy output in 2020 came from fossil fuels, was one of the countries with the lowest fossil fuel consumption.

The use of electric vehicles is becoming increasingly popular (Chinoracky *et al.*, 2022) and the e-concept’s proposed solutions are seen to be the answer to the environmental issues that face contemporary cities. The need to find solutions that lessen congestion, road is influenced by the intensification of travel, especially urban travel using transportation modes, as well as the increase in travel related to the distribution of goods and incident transport in cities (Diana *et al.*, 2020), as a result of the growth of e-commerce and the expansion of the package of courier services, especially in recent years as a result of COVID-19 (Kuzior *et al.*, 2022) and the continued growth of the urban population.

Electromobility principally refers to the use of electric vehicles for transportation of people and goods, such as e-cars, e-bikes, e-motorcycles, e-buses, or e-tractors (Bielski & Bednarczyk, 2020; Ebenezer *et al.*, 2021; Gao & Zhu, 2022; Netzer *et al.*, 2022). The prefix “e” makes it obvious that these cars are either entirely or partially powered by electricity, drawing power from the electric grid and storing it in batteries with the proper design. Such vehicles are perfectly suited for usage as delivery vehicles, taxis, shared automobiles, and eventually autonomous vehicles in urban environments (Campisi *et al.*, 2022). The absence of noise pollution, zero emissions, and efficiency are unquestionably benefits of such cars (Jung & Koo, 2018) It is also important to note that COVID-19 has altered Polish inhabitants’ mobility (Gorzelańczyk, 2020; 2022).

The aim of the analysis is to develop electromobility in the urban transport sector in Pila District. However, the success of this analysis will be possible at the moment of transformation in many important spheres. This may be a more global reference, but the development of many areas favorable to electromobility at the national level, will accelerate the introduction of new solutions at the micro-regional (local government) level, i.e. in the analyzed case in Pila District in urban transport.

## **Assumptions of the Urban Transport Electromobility Development Analysis**

In the case of the development of electromobility of urban transport, the public administration plays an important dual role. On the one hand, it must coordinate the entire undertaking, keeping in mind the appropriate pace of change in individual spheres. On the other hand, it is the recipient of transformations whose impetus is the design, use and development of the emerging infrastructure and vehicle market. The full cooperation of the central and local administrations is important. The good examples of countries where electromobility has been doing well for years (Norway, Germany, the Netherlands) show that the driving force behind the development of the market is both the long-term economic and environmental policies of governments and the response to local needs.

### **Means of Transport in Electromobile Urban Transport**

In the planned analysis of electromobility opportunities in urban transportation, we can identify several means of transportation that can contribute to increasing its offer and attractiveness in public space.

The first means of transportation, the most popular, which has been in operation for several years in Pila District, is the electric bus, which is the largest vehicle among those available and possible to introduce in urban space. The zero-emission fleet of urban transportation in this size range includes all electric buses, namely: battery vehicles, hydrogen vehicles and trolleybuses. The first two types seem to be the most feasible proposal for introduction in the urban transportation space of Pila District. On the other hand, the third type of vehicles – trolleybuses, in the case of the study area, would generate very high costs for the preparation of infrastructure facilities that do not currently exist.

At this point it is worth mentioning how an electric vehicle works. Its most important component, of course, is the system responsible for supplying electricity to the vehicle. The traction battery, commonly known as the battery, is the heart of the vehicle and its energy storage. It is what keeps the vehicle powered. The battery works by interconnected cells, the number of which varies from a few to many thousands, or even in the form of whole blocks of cells. Their parallel or series arrangement means that the traction battery in electric vehicles can reach considerable size, and for this reason it is usually placed in the chassis. Batteries differ primarily in their life cycle length, chemical composition and weight. Currently, lithium-ion batteries are the most popular, and the range of a vehicle on a single charge can reach about 200 km, considering buses (*Strategia rozwoju elektromobilności...*, 2022).



Let's also look at the types of batteries, which we can divide by chemical composition. The first group is lithium-ion batteries, which are divided into (*Strategia rozwoju elektromobilności...*, 2022):

- NMC (lithium-nickel-cobalt-manganese);
- LTO (lithium-titanium);
- LMO (lithium-manganese);
- LFP (lithium-iron-phosphate);
- NCA (lithium-nickel-cobalt-aluminum).

Of the aforementioned types, lithium-nickel-cobalt-manganese batteries are the most popular among electric vehicle manufacturers (Chargers, 2022). Traction batteries (and the materials used to build them) must meet a number of properties that are often difficult to reconcile. These include:

- performance and operational reliability;
- trouble-free operation and the absence of noticeable changes that degrade performance characteristics;
- relatively low production and operating costs;
- no or the least possible burden on the environment;
- high energy density and useful dispatchable power, which translates into the distance that can be covered.

In order to serve an area covered by urban transportation, a battery with a capacity of at least 120 kWh should be selected. In this case, charging time is estimated at 7.4 minutes in summer and 12.7 minutes in winter, with a possible mileage of 30-50 km.

As for the former means of urban transportation, it is worth noting that an electric scooter is definitely more economical than an internal combustion engine, as it consumes 2.5 kWh per 100 km, while an internal combustion engine uses about 3 liters of gasoline per 100 km. Electric scooters are equipped with gel or lithium-ion batteries. In addition, it can ride at a top speed of up to 45 km/h. The scooter is able to travel about 80 km on a single battery, which is a very good result in an urban space, since the city of Sawtooth itself and its surroundings is not a large metropolitan area. According to some data, sustainable urban planning definitely reduces the number of necessary daily transportation of city residents by up to 40-50% (Karlik, 2022).

Another proposal for the use of an electromobile vehicle in urban transportation is the electric scooter. It is worth mentioning that this means of transportation is not at all an invention of the 21<sup>st</sup> century, as the first electric scooter was developed as early as 1895 in the United States. In the modern development of scooters in our country, 2018 was a breakthrough year, when e-scooters with the possibility of mobile rental appeared in the space of Polish cities. The new lithium-ion batteries used at that time allowed them to move for 3-4 hours at a speed of 30 km/h. The first Polish city where an e-scooter system appeared was Wrocław (Jarosiński, 2021).

The use of electric scooters brings with it a number of advantages that may determine their success in the urban transportation electromobility space (Jarosiński, 2021):

- they are among the vehicles with high maneuverability and compact size, which allows them to move freely around the city, including overcoming any obstacles;
- can cover distances three times faster than moving on foot (accelerating to speeds of about 25 km/h);
- contribute to greater environmental protection compared to the car;
- allow you to bypass traffic jams;
- using a scooter you do not have to worry about parking and incur additional parking costs in the city;
- riding a scooter benefits from the pleasure caused by the ride itself and is a form of recreation.

Electric bicycles also have the potential to become another transportation alternative for people going about their daily lives in urban spaces. It is a means of locomotion classified as a single-track vehicle similar in design to a regular bicycle, which, as in its traditional form, is powered by human muscle power, but the additional source of energy is an electric motor.

In addition to lower maintenance costs, electric bicycles have many other advantages. This vehicle does not generate the exhaust fumes that are produced when using vehicles with internal combustion engines. This is a big plus for the environment. Electric bicycles contribute to fitness and well-being by providing a daily dose of outdoor exercise while reducing physical exertion, which is very beneficial during hot weather, for example. Using electric bicycles is also convenient, thanks to the ease of changing the battery and the ease of charging. Charging can be done anywhere with access to the electric grid, and the most important advantage is that it does not require specialized equipment (Wasik *et al.*, 2018).

Another vehicle in urban transportation is also an electric car, which, thanks to its longer range, can be a transportation alternative not only for residents of Tartak, but also for neighboring towns and the entire county.

## **Electromobility Infrastructure for Urban Transport**

An essential element for the success of electromobility development in urban transport in Pila District will also be a properly prepared infrastructure.

The necessary infrastructure for urban transportation, which is the basis for the operation of electric buses in Pila District, includes charging stations. The current options on the market, which apply to all vehicles, are (Rajé *et al.*, 2018):

– solar charging – made possible by photovoltaic panels mounted on the roof of the vehicle; for now, however, the energy from a day's charging only allows the vehicle to travel up to 5 km;

– pantograph charging – mainly used in buses; involves automatic connection of the installation on the roof of the vehicle to the charging station by means of a retractable pantograph;

– wireless (inductive) charging – wireless charging installations most often use inductive energy transfer, thanks to inductance or magnetic resonance technology, which are currently in the testing phase; this solution could be used in electric vehicles;

– in the testing phase; this solution could replace traditional charging, but could also help extend vehicle range – for example, by charging buses while they are stationary;

– wired charging – involves connecting the car itself to the charging device via a cable.

In Pila, pantograph chargers – on the order of 400 kW – should be installed on selected loops outside the Municipal Transport Company depot. In addition, stationary chargers could be installed at depots to fully charge and stabilize the batteries on a daily basis, and these would be assigned to each electric bus. Over time, as more vehicles of this type are gradually deployed, further supporting investments should be made, if only in the form of building more charging stations (*Strategia rozwoju elektromobilności...*, 2021):

– stations with an inverted pantograph, set up on a selected loop, with enough power to charge a bus, which should make a minimum of two runs and go down to the depot;

– free charging – at the Municipal Transport Company headquarters on Łączna Street, with enough power to charge a bus in no more than 4 hours; while implementing appropriate expansion of distribution and power supply networks and transformer stations, if necessary.

The process of implementing the infrastructure needed for a new fleet of electric buses in Pila District will be the biggest challenge for electromobility development. Significant cash outlays are needed to purchase new electric vehicles and build charging stations. It is also necessary to implement appropriate logistical solutions – the deployment of chargers throughout the district, as well as the reconstruction of the bus depot in Pila.

As for the implementation of other means of transportation into urban space, the outlay may be small. In the case of scooters and electric scooters, local government approvals will suffice, allowing companies that currently have a very well-developed service offer of this type to exist. To encourage investors, concessions such as tax exemptions can be introduced.

The infrastructure for scooters, bicycles and scooters is basically already in place, as vehicles of this type can travel on current streets and bike paths (in the case of scooters and bicycles). In order to increase the attractiveness and speed

of movement of these vehicles around the city, the construction of more bicycle paths or the separation of additional lanes on the roadway could be included in the planning of the space of Pila. Of course, there is also a need for spaces dedicated to parking such vehicles, which will not interfere with the movement of pedestrians and other means of transport.

In the case of electric cars, the urban transportation market can also operate on the basis of mobile rental of these vehicles. This process is made possible by so-called car-sharing, a mobile service that allows use through an app. Unlike traditional car rental, the user does not have to return the car to the place where it was picked up, but leave it at any convenient location. The service is particularly useful for occasional car users who drive less than 10,000 kilometers a year. According to some views, the car-sharing service may also eventually reduce the number of cars in cities through more efficient use of transportation (Olejniczak & Mendakiewicz, 2018).

## **The Economics of Electromobility**

What continues to discourage vehicle users from choosing the electric version is undoubtedly the price. In order to popularize electric vehicles on a wider scale, it is necessary to significantly reduce the difference in the price of obtaining such vehicles compared to combustion cars, given that for a group of players, the subsequent cost of operation is also as important as the purchase price.

For example, the cost of driving 100 kilometers in an electric car is primarily influenced by the price of electricity (1 kWh). Many studies also take into account the cost of battery operation. According to calculations by Ministry of Energy experts, the cost of driving 100 kilometers in an electric car is about PLN 10, assuming that such a car will consume up to 20 kWh of energy per 100 km. However, these are the costs of electricity itself and do not take into account any fees or commissions associated with the electric car charging service and the costs arising from battery consumption.

An important criterion for the development of electromobility is the electrification of the bus fleet in cities. An adequately expanded network of electric buses would manage to become a showcase for electromobility, and thus advertise and at the same time play an important role in spreading the idea to the public. Money for the replacement of the bus fleet used in urban transportation could also come from the proceeds of the emission fee, which is often included in environmental regulations and documents.

## Summary

Road transport is one of the key factors in the proper development and functioning of the country's economy. Thanks to the expanded road infrastructure, it is constantly booming. It constantly leads the way, and what is more, it is the most frequently chosen form of moving people, as well as goods. Individual passenger transportation, resulting from the enrichment of society, as well as wide access to passenger cars, is considered the most convenient and fastest mode of communication over medium distances. Moreover, users are in no way constrained by public transport schedules. However, such movement is causing an increasing environmental impact. Nowadays, cars and other electric-powered vehicles are becoming an alternative to traditional internal combustion vehicles, also reducing emissions of environmentally harmful pollutants.

The awareness of Polish society is improving year by year, which at the same time encourages the development of electromobility, which is becoming increasingly popular. The understanding of the need to care for the environment is also growing. Thus, people themselves are striving to change their existing habits. In addition, the availability of various means of transportation, such as an electric scooter, electric scooter, electric bicycle or electric car rental, makes the choice easier and "within reach".

The prospect of future benefits and conveniences associated with the use of electric vehicles is very attractive, so electromobility in transportation is expected to grow even faster. Among the many positive factors, it is worth mentioning, for example, the convenience and speed of movement, the fuel savings, the lower expenses associated with the lack of repairs or replacement of equipment components without which traditional cars cannot function, the possibility of additional subsidies, as well as a number of mobility privileges.

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## ROLE OF LARGE-FORMAT SHOPS IN THE FOOD RETAIL MARKET IN POLAND DURING THE COVID-19 PANDEMIC

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### Abstract

Crisis events in the past few years, including the COVID-19 pandemic, have in many cases laid bare insufficient resilience to changes in demand among businesses operating in Poland, particularly those in the service sector. Many have had to modify their way of distributing goods and to adjust to the new circumstances. As for the food retail sector in Poland, despite numerous restrictions and difficulties that consumers faced when visiting grocery shops, fluctuations in levels of food sales were relatively small. Large-format shops proved relatively adaptable, as they had already been using various distribution channels before the pandemic, and to a large extent this experience granted them quite a smooth passage through the pandemic. An important characteristic of supermarkets and hypermarkets is that their owners tend to have a large capital at their disposal, which additionally strengthens the resilience of such retail outlets to periodic crises, in contrast to smaller shops, whose financial cushion is much smaller, rendering them far more exposed to negative consequences of crises.

## ROLA SKLEPÓW WIELKOPOWIERZCHNIOWYCH W RYNKU HANDLU SPOŻYWCZEGO W POLSCE W CZASIE PANDEMII COVID-19

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Kody JEL: D40, D91, E32, M31.

Słowa kluczowe: rynek detaliczny, handel detaliczny, sklepy wielkopowierzchniowe, zmiany koniunktury, pandemia COVID-19.

### Abstrakt

Zdarzenia kryzysowe ostatnich lat, w tym pandemia COVID-19, obnażyły niedostateczną odporność na zmiany popytu wielu podmiotów gospodarczych funkcjonujących w Polsce, w tym w największej mierze z branży usługowej. Wiele z nich musiało przeprofilować swój sposób dystrybucji towarów i dostosować go do nowych okoliczności. W przypadku handlu spożywczego w Polsce, mimo wielu obostrzeń i utrudnień z korzystania z placówek oferujących towary tego typu, nie zauważono jednak dużych wahań sprzedaży. Stosunkowo dużą elastycznością wykazały się sklepy wielkopowierzchniowe, które w wielu przypadkach jeszcze przed wystąpieniem pandemii korzystały z różnorodnych kanałów dystrybucji swoich towarów, co w dużej mierze pozwoliło im na łagodne przetrwanie okresu pandemii. W przypadku tego typu placówek istotny jest fakt dysponowania dużym kapitałem przez jego właścicieli, co dodatkowo wzmacnia odporność na czasowe sytuacje kryzysowe, w odróżnieniu od mniejszych placówek, których poduszka finansowa jest dużo mniejsza, co naraża je w dużo większym stopniu na negatywne skutki tego typu zdarzeń.

## Introduction

Sale should be understood as a set of organisational, technical, legal and financial activities involved in the transfer of goods or services after they have been paid for. Sale can also be defined as a process of persuading someone to buy certain products or services. Sales planning is one of the most important responsibilities of any sales department in a company. Identification of the basic goals of a given company's unit for a set period of time is a task included in the sales forecasts and targets. How these goals are to be achieved is specified in a sales plan. The sales plan defines sale goals and communicates them to the company's employees, in addition to which it formulates the method of cooperation with subordinate sales personnel (Chęć *et al.*, 2021, p. 20).

Traditional forms of selling are based on face-to-face contact between a buyer and a seller. The contact with goods being sold is mediated by the seller. Within this form, it is worth distinguishing the type of sales with well-developed customer service, where the contact with the client is closer. The person who sells goods identifies the buyer's needs, presents available products, suggests the choice, accepts and finalises the order. Another traditional form envisages reduced

customer services and is employed in outlets where contact between the seller and buyer is not essential. Such form of sales can be seen in newsagents, grocery shops, and other small retail outlets. In this form, the seller hands over the ordered goods and collects the payment.

More modern forms of sales limit or sometimes completely eliminate the role of a seller, and therefore the contact between the customer and the goods becomes direct. Quick customer service and close contact with the goods are most important in this form of sales. This enables earning higher profits from the enterprise owing to a more rapid pace of sales and closer contact with products, the latter being conducive to impulse buying. The implementation of such forms of sales necessitated some changes in the design of shops, as now customers move around the whole sales floor and look at goods. An example is self-service sales, where the buyer picks products themselves, read out the total payment due and then makes the payment. In this form, too, the customer has full access to goods, which are logically laid out on shelves along the shop aisles, which accelerates shopping. The buyer decides how much time they will spend shopping, and make choices in the shop while avoiding any awkward situations. Such form of sales is suited for simple and relatively inexpensive products, which do not demand any assistance of the shop staff. Another form of selling products is preselection sales, where goods are laid out in such a way that customers can easily and independently make their buying choices. They can freely compare any product with others, can try on or look at products for example, and the contact with the seller occurs only at the very end of the buying process. Such strategies are most often employed for selling clothes or shoes. Selling from vending machines is characterised by the lack of any dependence on the shop's opening hours. This form of sales is gaining popularity in Poland. Buying from vending machines is convenient but limited in terms of the range of products (Bał-Filipek, 2020, p. 31-33). Nowadays, the sales form with the highest potential is selling through electronic channels. Some entrepreneurs decide to launch online selling as an additional channel to the conventional purchase of products while others clearly focus on conducting their business in the virtual world. There are numerous benefits from selling online. For example, it is possible to present the company's offer clearly and in great detail. The customer is constantly updated on the follow-up of their orders, which makes shopping comfortable and convenient. An unquestionable advantage of online selling is that it creates a chance to attract customers from distant areas. A disadvantage is the limited contact with the customer (Brdulak 2017, p. 102, 103). However, it is worth noting that despite the constant development of state-of-art forms of sales, the traditional method continues to play a key role in the lives of Polish customers, especially when it comes to buying everyday goods.

## Large-Format Shops in Poland and Their Characteristics

In 2020, the gross added value generated by businesses providing services constituted 65.7% of the gross added value of the entire Polish economy. The dominant activity (according to added value) among all service providers was commerce (26.4%). It is comprised in section G and covers: wholesale and retail trade; repair of motor vehicles, including motorcycles.

In 2020, companies included in section G generated the revenue from sales in current prices of PLN 1,964.8 billion. The highest sales revenues in current prices in section G were obtained by wholesale and retail commerce enterprises (58.3% and 30.3%, respectively). Moreover, among all service providing companies, the ones engaged in trade were characterised by high employment. In 2020, the average employment in trade companies was 1,707.3 thousand people, which meant 2.1% fewer than in the previous year.

The value of wholesale sales in 2020 in Poland was 1,152,972.8 million Polish zloty (Tab. 1). Over years, businesses conducting wholesale sales have increased their sales value. However, it should be underlined that the value of wholesale sales in most Polish provinces decreased in year 2020 compared to 2019. The highest contribution to the overall wholesale sales was made by the sales of non-food products (84.4%). The sales of food and non-alcoholic beverages made up 13.1% and alcohols – 2.5%. A decrease in wholesale sales was observed in the group of foods and non-alcoholic beverages (by 1%) and in the group of non-food goods (by 0.4%). The only increase in the value of wholesale sales was noted for alcoholic beverages (by 3.8%) (Adach-Stankiewicz *et al.*, 2021).

Table 1

Dynamics of wholesale sales in total in years 2015-2020 (in million PLN)

Year	2015	2016	2017	2018	2019	2020
Poland	822,281.7	871,895.6	984,172.9	1,091,290.0	1,163,184.3	1,152,972.8
Min.	6,426.2	7,772.1	8,255.0	9,172.8	9,382.0	8,456.8
Max.	301,986.1	331,608.1	366,410.0	410,214.1	432,212.3	423,646.7

Source: the author, based on data from Local Data Bank.

In 2020, the retail sales value in current prices generated by commerce and non-commerce companies in Poland reached 890,637.10 million Polish zloty. In comparison with the previous year, a decrease by nearly 3% was noted (Tab. 2), of which the sales of non-food goods had the highest value in the total retail sales (PLN 569.4 billion).

In 2020, the highest contribution to the achieved sales was made by the business entities employing at least 50 people (54.2%); 27.6% share was generated by entities with up to 9 employees, and 18.2% – by businesses hiring from 10

Table 2

Dynamics of retail sales in total in years 2015-2020 (in million PLN)

Year	2015	2016	2017	2018	2019	2020
Poland	721,998.5	754,964.4	810,233.6	862,066.3	917,671.3	890,637.1
Min. (opolskie)	8,727.6	8,549.5	9,931.5	10,306.1	10,324.0	10,770.3
Max. (mazowieckie)	207,623.4	216,326.9	232,560.7	244,669.0	265,798.3	244,393.6

Source: the author, based on data from Local Data Bank.

to 49 people. Over the years submitted to our analysis, retail sales increased. However, they decreased in 2020 due to the COVID-19 pandemic. A considerable impact was made by periodic restrictions imposed on retail outlets. In 2020, there was an increase in sales of foods and non-alcoholic beverages (by 6.5%), alcoholic beverages and tobacco products (by 9.7%), while the sales of non-food goods decreased (by 5.5%). The sales of basic necessities, such as foods and beverages, increased. The highest contribution to the country's total retail sales was made by the mazowieckie province (27.4%), while the smallest one was attributed to the opolskie province 1.2% (Adach-Stankiewicz *et al.*, 2021). The highest value of sales per capita over the analysed period of time was noted in the mazowieckie and wielkopolskie provinces, while the lowest one occurred in the warmińsko-mazurskie province (Fig. 1).

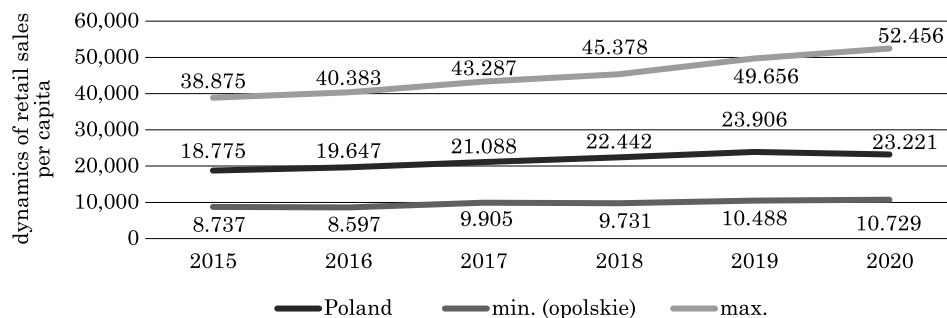


Fig. 1. Dynamics of retail sales in Poland in years 2015-2020 (in PLN)

Source: the author, based on data from Local Data Bank.

In 2020, there were 319,936 shops in Poland (Tab. 3). Compared to the previous year, that meant a decrease in the number of shops by 4% (13,404). Also, there was a decrease in the total sales floor area by 0.1%, as it equalled around 37,185 thousand m<sup>2</sup> in 2020. The biggest decline in sales floor area was noted among shops size between 100 and 299 m<sup>2</sup> (7.2%), while the smallest one was among shops with are area of up to 99 m<sup>2</sup> (1.7%). The shops which possessed 400 to 999 m<sup>2</sup> sales floor area grew larger by 4.2%. In 2019-2020, the number of shops decreased from 333,340 to 319,936 (Adach-Stankiewicz *et al.*, 2021).

Table 3

## Dynamics of the number of shops in Poland

Year	2015	2016	2017	2018	2019	2020
Poland	360,750	367,011	355,043	339,880	333,340	319,936
Min. (opolskie)	8,850	8,218	7,871	7,592	8,261	7,266
Max. (mazowieckie)	50,104	58,536	55,643	51,413	47,474	46,597

Source: the author, based on data from Local Data Bank.

In 2020, there were 120 persons per shop on average, while a year before that figure was 115 (Fig. 2).

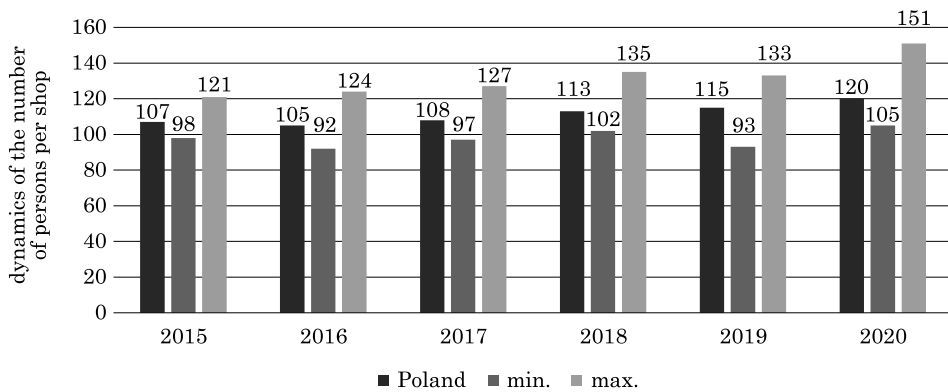


Fig. 2. Dynamics of the number of persons per shop in Poland, in years 2015-2020

Source: the author, based on data from Local Data Bank.

The highest number of customers per shop (151) was noted in 2020 in the podkarpackie province. This is explained by a nearly 2000 decline in the number of shops. In year 2020, compared to the previous year, there was a drop in the number of shops of almost all branches in the country (Fig. 3).

The largest share in the total number of shops operating in year 2020 was composed of those selling other goods (44.6%), food (20.5%) and clothes (10.3%). In 2020, the least numerous were fish shops (0.3%). The highest decrease in the number of shops was observed among shops with other goods (a decline by 6.7 thousand shops). Also, the number of shops with motor vehicles decreased (by 4.1 thousand) and general food shops (fewer by 2 thousand shops). However, an increase was observed in the number of shops classified into four branches. The highest increase was recorded among clothes shops (900 more outlets) and shops with textiles (400 shops). Also, the number of shops with cosmetics and toiletries and shops with furniture and lighting equipment increased slightly (Adach-Stankiewicz *et al.*, 2021).

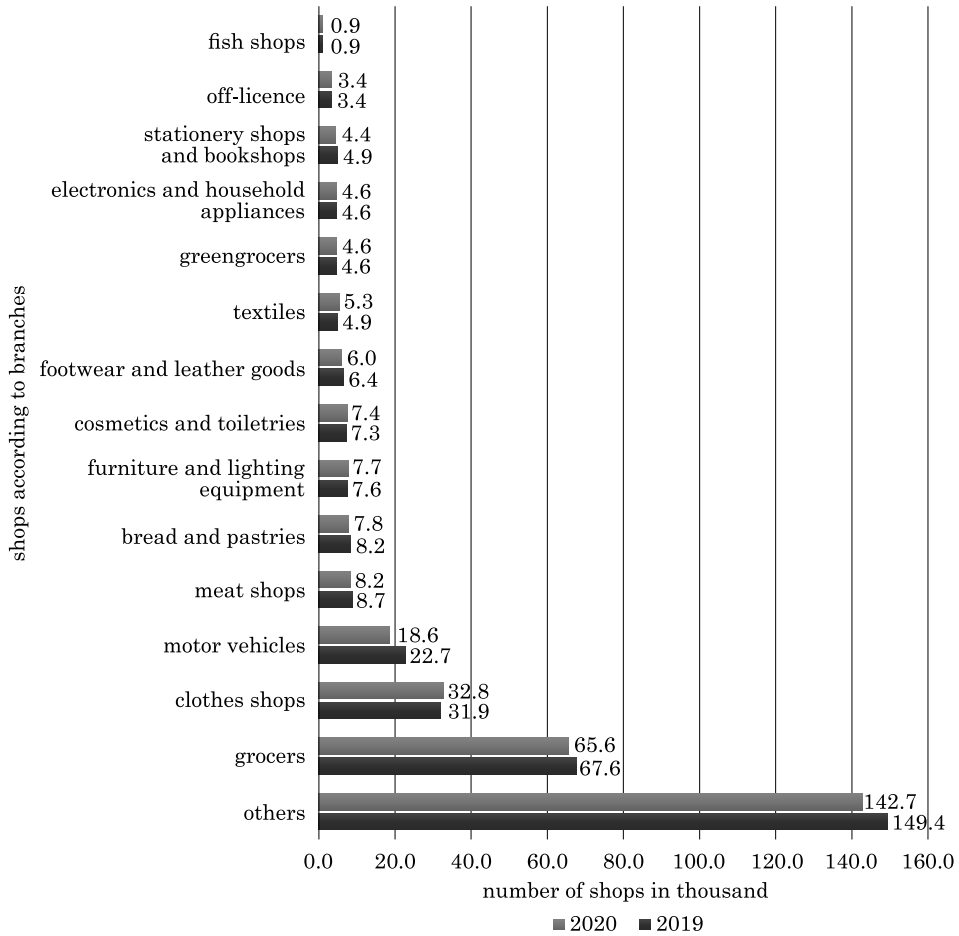


Fig. 3. Structure of shops according to branches in Poland in years 2019 and 2020  
Source: the author, based on data from Statistics Poland (GUS).

## Characteristics of Retail Trade in Large-Format Shops in Poland

In Poland, the food retail trade is dominated by large foreign retail chains, including Biedronka, Lidl, Kaufland, Auchan. Discount shops, hypermarkets and supermarkets compose the majority of the retail market. There are also Polish retail chains in the segment of large-format shops, such as Stokrotka, Polomarket, Dino, Top Market (Tab. 4). However, these companies face strong international competition, which significantly hinder their development (Momot *et al.*, 2016).

Table 4

## Structure of retail chains in food retail trade in Poland

Form of sale	Segment	Biggest chains
Modern	hypermarkets	Auchan, Kaufland, Carrefour, E.Leclerc
	discount shops	Biedronka, Lidl, Aldi, Netto, Mere
	large supermarkets	Auchan, Intermache, Carrefour market, E.Leclerc
	proximity supermarkets	Spar, Dino, Stokrotka, Mila, Polomarket, Freshmarket
	convenience shops (including hard franchising)	Żabka, Delikatesy-Centrum, Express, Spar Express, Spar, Topaz
	soft franchising	Lewiatan, Groszek, Top Market, ABC, Euro Sklep, Livio
Traditional	traditional retail trade	Spółem

Source: the author, based on the report *Polski Rynek Handlu Spożywczego w 2010-2020*.

Hypermarkets are shops with the floor area over 2,500 m<sup>2</sup> which offer both food and non-food products. The range of products is between 30,000 to 50,000, of which more than half are food products. Hypermarkets are most often situated in suburbs of large cities. Supermarkets are also large shops. Their sales floor area varies from 500 to 2,500 m<sup>2</sup>. They are also shops with a mixed range of products, which offer between 5,000 to 10,000 products. Food products make up at least 70% of the shop's offer. Large supermarkets are often situated in housing estates of large and medium-size towns. Discount shops can be found in similar locations. Discount shops are the type of shops with sales floor area similar to that of supermarkets, but usually offering up to 2,000 products, with the prevalent share of food products, up to 95% of all goods. A large share of products are sold as own brands, that is products manufactured specifically for a given retailer, and these can make up from around 60% of all products in Biedronka to 90% in other chains (Pasternak & Musiał, 2023). A distinguishing feature of discount shops are relatively low prices, which can be kept so low owing to low retail margin rates, lower costs of customer service, transport and storage of goods, as well as the use of special offers. Discount shops usually display modest interior furnishings, and the small staff are mostly busy operating checkouts and replenishing goods on the shelves in the shop (Twardzik, 2017, p. 12). Examples of discount shops in Poland are the chains Biedronka, Lidl, Netto and Aldi, of which Biedronka has the most shops, over 3100 outlets all over Poland. In practice, however, discount shops increasingly often widen their range of products and pay more attention to overall quality. As a result, although the prices are still quite low, the difference between discount and other shops is to some extent blurred (Kondej, 2017, p. 19, 20).



Biedronka, Lidl, Netto and Aldi, that is the four biggest chains of retail shops in Poland, secured a nearly 40% share of the retail trade market in Poland in the third quarter of 2021. Supermarkets, hypermarkets and discount shops (that is modern retail outlets) reached over 60% (KRWL, 2021). The huge success of discount shops stems from their adaptability to buyers' needs and expectations. Discount shops satisfy the demand of many consumers, who consider low prices as an important decision stimulus. Moreover, discount shops are often situated in residential areas, which makes them convenient for doing everyday shopping. The improved visual layout of discount shops and enrichment of their offer has enabled them to attract more demanding customers. These factors have contributed to the current popularity of discount shops, whose number is constantly growing (Kondej, 2017, s. 154). In 2015, there were 3,600 discount shops in Poland, compared to around 2,200 in year 2010. Back in year 2000, there were only 700 such shops in whole Poland, but 2 years later that number increased to over 900. In 2004, the number of discount shops rose to 1,150, and then to 1,540 in 2006 and 1,690 in 2008. Discount and large-format shops as well as multi-functional shopping centres are the most rapidly developing forms of contemporary trade; in contrast, the growth of supermarket and hypermarket chains has slowed down since 2010. Discount shop chains appear in almost all Polish towns, and are now spreading to the countryside (Twardzik, 2017, p. 11, 13).

In many small Polish towns, Biedronka is the only chain of discount shops. Lidl most often locates its outlets in western Poland and in Masovia (central Poland). Another chain called Netto also prefers western and central Poland. Of these three chains, Aldi has the smallest number of shops, and these tend to be situated in larger towns (Twardzik, 2017, p. 16).

The other segments include shops with the sales floor area of up to 500 m<sup>2</sup>. They are typically situated in residential areas of large, medium-size and small towns. The floor area of proximity supermarkets varies from 200 to 500 m<sup>2</sup>. These shops operate under hard franchising schemes or as independent shops. They offer from 4,000 to 8,000 products, of which 90% are food products. Convenience shops are run in the same form, but they include self-service. Their floor area is small, just around 60 m<sup>2</sup>. They offer basic food products, alcohols, tobacco and newspapers. The convenience sector in Poland encompasses the chain called Żabka, which has the largest number of shops in Poland (7,325 in June 2021). Shops run as soft franchises are typically self-service ones. The sales floor area is usually between 50 and 300 m<sup>2</sup>. Traditional retail forms, that is single grocery shops, not organised into chains, are still prevalent in the Polish countryside (*Polski rynek handlu spożywczego...*, 2016; *Sektor spożywczy...*, 2022).

In 2018, hypermarkets represented 1% of the retail market structure in Poland. Supermarkets and discount shops made up 5% of the market each. The largest share of the above market was composed of traditional retail commerce (89%) (Tab. 5).

Table 5

Dynamics of the number of large retailers in Poland in 2015-2018

Type of shops	2015	2016	2017	2018
Large-format shops	7,172	7,245	7,362	7,629
Hypermarkets	342	344	346	341
Supermarkets	3,133	3,125	3,167	3,281
Discount shops	3,697	3,776	3,849	4,007

Source: the author, based on the *Raport. Perspektywy poprawy konkurencyjności...* (2020).

In 2018, there were 341 hypermarkets operating in Poland, which meant a 1.4% decline relative to the previous year. In that year, the most numerous type of shops in Poland were discount outlets (4,007). However, it is worth noting that the formal differences distinguishing these forms of retail sales are increasingly less distinct. The strong competition between retailers forces some hypermarket owners to lower prices while owners of discount shops feel obliged to improve the quality of customer service (*Raport. Perspektywy poprawy konkurencyjności...*, 2020; *Nowe trendy w segmencie niezależnych...*, 2020).

According to the 2021 Listonic report, Lidl was the most popular chain of grocery shops in the category of food shops and discount shops (*Ranking popularności sieci handlowych w Polsce*, 2021). In that year, Lidl reached over 27% share among all Listonic lists of shops. Despite a decrease of 7.78 percent points compared to the previous year, this German chain remained the leader for the third time in a row. This was made possible owing to the broad support to the prosperity of outlets, for example by allocating a large budget to advertising, enrichment of the assortment of products, and improvement of the loyalty application. The second place in the Listonic ranking was secured by the chain of discount shops Biedronka. The share of this chain equalled 25.31% and in comparison to the previous year it meant a decrease by 4.57 percent points. At that time, this Portuguese chain of discount shops introduced self-service checkouts as a convenience for the staff and customers. In addition, the customer loyalty campaign called “Gang Swojaków” encouraged customers to buy more. The third place on the podium was won by the French hypermarket chain Auchan, which relative to the year before achieved an increase by 0.48 percent points and gained a share of 9.88%. In year 2021, Auchan celebrated its 25<sup>th</sup> anniversary of operation on the Polish market.

In the category of proximity and convenience shops in Poland, the chain Dino enjoyed the largest share (3.15% among all Listonic shop lists). The second place was taken by the convenience shop Żabka, with its share of 2.85%, while the third place was secured by Stokrotka, with a 1.69% share.

In the past few years, the food sector in Poland has experienced stable development. This is confirmed by the steady increase in food retail sales.

The worrying economic situation that occurred in 2020 has not hindered the growth of this sector. It is expected that in the near future the retail food sales in traditional shops will increase by about 2.5% annually. For a number of reasons, it is certain that online food shopping will not dominate over traditional sales. Customers definitely prefer to go to traditional shops, if only because they find it easier to choose from many products – all goods are clearly displayed in one location, and these products are tangible. When it comes to small products, especially food ones, e-commerce is practically unable to compete with traditional sales. It can only act as a supplementary form of shopping. The choice and purchase of the right goods in an online shop would be both inconvenient and time-consuming. For the time being, potential benefits to be gained from making purchases from home are outweighed by the disadvantages of this form of sales. This will forever be compounded by the fear of receiving the goods that may fail to meet one's expectations. When buying food products in a conventional shop, consumers can see how fresh the products are, check their best-before dates, etc., which can be more difficult if not outright impossible when buying online. The multitude of traditional retail outlets and the variety of offered goods mean that consumers prefer to buy the brands that they are used to and to do shopping in their favourite shops.

The growth of retail sales in Poland entails an increasing availability of various sales outlets in convenient locations, close to one's place of residence. The consumer is less likely to struggle with the issue of a distance to the nearest shop but is more likely to face the challenge of choosing the shop to do shopping because of a large number of shops situated at a similar distance from where they live. The COVID-19 pandemic demonstrated that even a threat of potential infection did not deter consumers from visiting their favourite shop. At that time, the problem for the buyer was the restrictions imposed on retail outlets by the authorities rather than the fear of the pandemic. On the other hand, large-format shops which offer a broad assortment of products at one place attracts many buyers, which enables these shops to offer goods at affordable prices, which in turn is still a top priority for most consumers in Poland. This stimulates an avalanche growth of large-format retail shop chains in Poland. Such business enterprises, because of the huge turnover they generate in comparison to small local shops, are able to put up with a decrease in revenues over a longer time in an event of a crisis.

However, this does not mean that online shops which offer the same type of products cannot compete with traditional shops. In recent years, some transformations have been occurring in Poland and elsewhere in the world in how the sphere of consumption is shaped. The contemporary consumer differs significantly from consumers even a few or a dozen years ago. New consumption trends have emerged. An example is smart shopping. Consumers search for the best possible offer available on the market, which will meet their demand to the highest degree, using for this purpose a variety of sources (both

traditional and e-commerce). Traditional shops are therefore forced to compete in prices with online sellers and/or to expand the range of services they offer in order to encourage consumers to do shopping in the traditional form (*Raport. Perspektywy poprawy konkurencyjności...*, 2020; *Sektor spożywczy...*, 2022; Zalega & Rostek, 2015). In the long run, this will stimulate some evolution of traditional ways of distributing goods, and will force entrepreneurs to modify and adjust their ways of running business to the changing environment.

## Summary

The growing prosperity of the Polish society observed in recent years has not only stimulated a rise in the level of spending but also led to some changes in consumer behaviour. Polish households are interested in buying a large and diverse assortment of products. Small shops, which are unable to compete with large-format ones neither in terms of the variety and richness of their sales offer not in prices, are steadily losing popularity. The price of a product is still one of the key determinants of Polish consumer choices. Poles want to buy cheap but also, and possibly foremost, they want to make purchases at 'bargain' or 'promotional' prices, which gives them the impression that they manage their budgets efficiently and endows them with the sense of greater satisfaction from their purchases. The role of large-format shops gains in importance during crisis situations, like the recent COVID-19 pandemic. Going to such shops allows one to reduce the number of visits to shops and to buy a variety of products in large quantities. Paradoxically, such events are not only an obstacle to the expansion on the market but also lead to the marginalisation of small shops. This development is further strengthened by the fact that large-format shops are more resilient to fluctuations in demand owing to much greater financial resources and therefore a bigger 'financial cushion', which ensures the survival in the face of unfavourable fluctuations in the environment. With their large resources, the large-format retail shop model creates better opportunities to supplement their distribution channels by launching other channels, e.g. online ones, which in the event of a pandemic threat can effectively cushion any decline in revenues from traditional sales. It can therefore be expected that in near future such retail chains will gain in importance in overall sales of food products, both in Poland and in all developed market economies.

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## RENEWABLE ENERGY SOURCES IN POLAND IN 2014-2023 AND THE PERSPECTIVE OF THEIR DEVELOPMENT UNTIL 2030. A CONTRIBUTION TO THE DISCUSSION

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Key words: renewable energy sources, energy independence, energy goals.

### Abstract

This article discusses the state of renewable energy sources (RES) in Poland, comparing it with the one in the EU-27. It has been emphasised that the Polish government is obliged carry out the EU policy, also in terms of energy targets. Thus, Poland is committed to achieving a 31.5% share of RES in all energy generation sources by year 2030. The aim of this study has been to determining the state of RES in Poland and determining the prospects for their further development based on it. The state of RES development in Poland has been determined on the basis of generally available statistical data (Poland Statistics GUS). Eurostat was the source of data pertaining to the European Union. According to preliminary data, in 2023, the share of RES in Poland was 27%, compared to 44% in the EU-27. Having determined the state of RES development in Poland, we were able to identify prospects for their future development. The prognosis made in this study substantiated the conclusion that the set target of 31.5% share of RES in all energy sources will not be achieved in Poland. The Polish economy is progressing in the right direction, and the RES share is increasing year to year, but the pace of this progress is too slow. Some ways of increasing the RES contribution to overall energy generation as well as certain obstacles to the growth of RES are implicated in this article. Attention has been drawn to the impact of the COVID-19 pandemic and war in Ukraine on the energy sector.

## ODNAWIALNE ŹRÓDŁA ENERGII W POLSCE W LATACH 2014-2023 I PERSPEKTYWA ICH ROZWOJU DO 2030 ROKU. PRZYCZYNEK DO DYSKUSJI

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Słowa kluczowe: odnawialne źródła energii, niezależność energetyczna, cele energetyczne.

### Abstrakt

W artykule przedstawiono stan odnawialnych źródeł energii (OZE) w Polsce, porównując go ze stanem w UE-27. Podkreślono, że polski rząd musi realizować politykę Wspólnoty, również w zakresie celów energetycznych. W związku z tym Polska jest zobowiązana do uzyskania do 2030 r. 31,5-procentowego udziału OZE w źródłach wytwarzania energii. Celem badań było określenie stanu OZE w Polsce i ustalenie na jego podstawie perspektyw ich dalszego rozwoju. Stan rozwoju OZE w Polsce określono na podstawie ogólnodostępnych danych statystycznych (GUS). Źródłem danych o europejskim zasięgu był Eurostat. Według wstępnych danych udział OZE w 2023 r. wyniósł 27% w Polsce i 44% w UE-27. Po określeniu stanu rozwoju OZE w Polsce możliwe było określenie perspektywy ich rozwoju. Wyniki przeprowadzonej prognozy pozwoliły na stwierdzenie, że w Polsce do 2030 r. nie zostanie osiągnięty cel 31,5-procentowego udziału OZE w źródłach wytwarzania energii. Polska gospodarka zmierza w dobrym kierunku. Z roku na rok wzrasta udział OZE, tempo zmian jest jednak zbyt wolne. W artykule wskazano na sposoby zwiększenia udziału OZE w źródłach wytwarzania energii, podkreślając jednocześnie liczne bariery ich rozwoju. Zwrócono uwagę na wpływ pandemii COVID-19 i wojny w Ukrainie na sektor energetyczny.

## Introduction

Renewable energy sources (RES) are a concept that most of us are well familiar with. What is more, the vast majority of people are in favour of the development of RES (cf.: Witkowska-Dąbrowska *et al.*, 2021, p. 9-11; Wierzbicka, 2022, p. 4, 5; Sikora & Zimmiewicz, 2023, p. 456-475). Public support is a favorable factor for RES development. Its absence could cause spatial conflicts and consequently block further development.

Being a member state of the European Union, Poland is obliged to implement the European Community's policies, including the energy policy. The first goal of the EU-planned development of RES, which was to achieve a 12% share of RES in all energy sources by year 2010, was planned back in 1997 (the Kyoto Protocol) (Communication from the Commission. Energy for The Future, 1997). This aim was not binding for the EU countries, but it served as a tool to monitor progress of the ongoing transformation. In the subsequent years, there were other agreements and directives that modified the above goal. Mention should be made here of the following RED directives (Renewable Energy Directive). The first, RED I (Directive 2009/28/EC of the European Parliament and of the



Council of 23 April 2009..., 2009), imposed an obligation on all European Union countries to increase the share of energy generated from RES in total energy consumption by 2020. (15% for Poland). The second, RED II (Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018..., 2018), maintained this goal. The third version of the RES Directive (RED III) set the share of RES at a level of 42.5% for the European Community's economy to be attained by year 2030 (Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023..., 2023). It did not introduce mandatory targets for individual countries. However, the transformational goals it set allowed for an estimated share of 31.5% in Poland. Setting energy goals is essential for stimulating the transformation, adjust the network infrastructure, and to ensure the availability of adequate production capacities (Adamczewski & Wójcik, 2023, p. 5).

No discussion that raises the question of deviating from fossil fuels can neglect the European Green Deal, a strategy for the growth that aims to create a resource-efficient, up-to-date and competitive economy, and whose ultimate objective is to achieve zero emission of greenhouse gases by 2050 (Wrzaszcz & Prandecki, 2020, p. 156-179). The cost of building zero-emission economy in Poland is estimated at 700-900 billion Polish zloty. Such high estimates are a consequence of the Polish economy possessing an energy-intensive structure, with a high share of coal in the energy mix (Sobolewski, 2020, p. 1-4). More on RES in the context of the European Green Deal is written by:

– Mielczarski (2021, p. 84-87), who already in the introduction emphasized that although the European Green Deal is controversial, it can contribute to the long-term modernization of the Polish economy;

– Olczak (2020, p. 115-128) pointed out that the development of RES is primarily the diversification of energy sources and, consequently, the improvement of the country's energy security;

– Ciechanowicz-McLean (2021, p. 9-20), summarizing her consideration of the European Green Deal, pointed out that it is “an effort to face the challenge of disturbed relations: human-environment”;

– Szczubelek (2022, p. 175-190) pointed out that due to the scale of reforms planned, the European Green Deal is the most extensive legislative initiative in the entire history of the EU.

Importing fossil fuels, which are the fundamental source of energy generation in the EU member states, from outside the European Union lead to several negative consequences (Adamczewski & Wójcik, 2023, p. 6; Adamowicz, 2021, p. 13-33; Pangsy-Kania & Wierzbicka, 2022, p. 86-102):

– financial ones: these imports cost the EU economy € 720 billion in 2022 (*Import produktów energetycznych od UE...*, 2023);

– economic ones: this money is transferred to other economies, the EU competitors, driving their development;

– environmental problems: high carbon dioxide emission (*Emisje gazów cieplarnianych...*, 2023).

An antidote to these problems, able to alleviate their adverse impact, is to increase the use of RES. Unquestionably, renewable energy sources are friendly to the environment (they are an alternative to fossil fuels and help to reduce GHG emission) and, in the long term, they create a chance to ensure energy independence (Gomółka & Kasprzak, 2023, p. 483-507), the significance of which became so acutely felt after the invasion of Ukraine by the Russian Federation and the outbreak of fuel war between Russia and the EU. Krzykowski (2022, p. 93-113) and Tokarski (2022, p. 10-16) report in greater detail on the economic consequences of war in Ukraine and on its impact on the energy market. Krzykowski stresses that in an interdependent, globalized world, war cannot be narrowed down, to a single region. The Russian invasion has caused numerous consequences, including instability in energy security. Tokarski points to rising gas prices and supply shortages as a result of the war. Domestic sources of energy generation should be rebuilt (offshore wind farms, nuclear power, photovoltaics should replace coal-fired power plants).

A possible way to achieve the goal set by the EU could involve firstly changes within the road transport sector, including the development of electromobility (Brdulak & Pawlak 2021, p. 31-42; Dereń & Owczarek, 2021, 19-30), and secondly the use of green hydrogen (Stocki & Hübner, 2021, p. 117-128). It is also crucial to develop onshore and offshore wind energy and photovoltaics. However, these sources, due to their dependence on the weather conditions, can be problematic. Moreover, restrictive legal regulations also constrain the growth of such energy generating facilities (Tora *et al.*, 2022, p. 111-118; Bojar-Fijałkowski, 2021, p. 63-75; Act of 20 May 2016 on investments in wind farms, 2016). Thermal insulation of buildings and use of heat pumps are also important (Adamczewski & Wójcik, 2023, p. 20).

The aim of this study has been to determining the state of RES in Poland and determining the prospects for their further development based on it. The following research questions were put forth: are we in Poland moving away from conventional sources of energy? Is there an increase in the use of RES? Is Poland able to reach the energy goals set by the European Union? Is it able to secure energy independence? Which type of RES is developing most rapidly?

The above research questions led to the following hypotheses:

H1: Although there is progress in the development of renewable energy sources in Poland, the Polish economy is significantly different in this regard from other EU economies.

H2: With the current rate of growth, the Polish economy is able to reach the goal set by the European Union.

Recent years have seen increased development of RES and an increase in their share of energy generation sources (more than  $\frac{1}{4}$  in 2023). Maintaining the growth trend at this high level could result in Poland achieving its energy goals faster than the European Union imposes. The present work is a probe to fill this research gap.

The share of RES use in the Polish economy should reach 31.5% by year 2030. It is one of the lowest targets in the EU-27. It is only the Czech Republic that has a lower goal, while the highest one was set for Sweden (around 75%). Poland met the energy goal for year 2020, which was 15%. This was made possible due to the outbreak of the COVID-19 pandemic, which limited the consumption of fossil fuels in the countries where lockdowns were imposed (cf. Bulut, 2020, p. 284-295; Prol & Sungmin, 2020, p. 1-29), especially in transport (more on this topic in: Adamczewski & Wójcik, 2023, p. 13; Łukasiewicz, 2022, p. 85-108). It should be underlined, however, that the COVID-19 pandemic brought about many negative consequences in the energy sector. Just & Echaust (2023, p. 41-66) pointed out that the period from the outbreak of the pandemic to early 2023 is associated with an increase in energy market price volatility. Górska (2023, p. 109-128) saw in the pandemic the reason for the increase in energy poverty levels in Europe. It is worth emphasising that according to the strategies already prepared by the Polish administration, that is the Polish Hydrogen Strategy until year 2030 with an outlook until 2040 (2021), the National Plan for energy and climate for years 2021-2030 (2019), Strategy for the heating sector until 2030 with an outlook until 2040 (2022), the Energy Policy for Poland until 2040 (2021), the 31.5% goal will be achieved until 2030. Thus, the measures taken for the sake of energy transformation have already been planned. However, with the current pace of development, is it realistic to achieve this goal?

## Research Methodology

The state of the RES development in Poland has been determined on the basis of publicly available statistical data. The website of Statistics Poland (GUS) provides many reports and studies, which are updated on an ongoing basis. Another valuable source of European data is Eurostat.

Having determined the current state of the RES development in Poland, it was possible to identify the prospects for their further growth. Forecasting consists of predicting the course of probable future events. The literature describes many methods for prognosis of economic processes and phenomena. Mathematical models based on the assumption of continuity and predictability of processes and the use of historical data are employed for forecasting – and one of the main requirements for growth models is their consistency with the development observed in the past (Strużak, 2009, p. 39). Continuation of the current state is the most probable within the predictability horizon (Peitgen *et al.*, 2002). This study employed a logistic function to model various growth processes. According to this function, as development proceeds, the initial rapid growth rate decreases to reach an impassable limit at the final stage. The logistic function is characterized by a good fit to historical data. This argument spoke for its use in the study.

In the simplest form, this function can be written as follows (Strużak, 2009, p. 45):

$$y = \frac{1}{1 + \exp(-t)},$$

where:

$y$  – function of growth (equal 1 at the most),

$t$  – time.

For its practical application, this function was modified by introducing three time-constant numerical parameters determining the course of the function –  $a$ ,  $b$  and  $c$  (Grzegorek & Wierzbicki, 2009, p. 119):

$$y = \frac{a}{1 + b \exp(-c \cdot t)},$$

where:

$a, b, c \geq 0$ ,

$a$  – saturation of the analysed phenomenon determined heuristically,

$b, c$  – parameters of the function selected through statistical estimation.

For the logistic function to serve the forecasting of economic phenomena and processes, values of parameters  $a$ ,  $b$  and  $c$  must be adjusted to historical data, with the shortest time series having at least three elements so as to obtain reliable results; however, the longer the time series, the better the estimation – owing to the lower impact of random errors (Grzegorek, 2012, p. 32).

In the research conducted, parameter  $a$ , which defines the natural saturation level, was taken at 31.5%, as this is the target the Polish economy is expected to reach by 2030. Parameters  $b$  and  $c$  were selected through statistical estimation performed in Statistica 13.

Surówka (2023, p. 135) in her research confirmed the hypothesis: “Dynamic changes in the production of electricity from renewable energy sources mean that making forecasts of the formation of this phenomenon should be considered experimental”, but it should be remembered that forecasting is only an attempt to predict the future. Setting energy goals is essential for stimulating the transformation, adjust the network infrastructure, and to ensure the availability of adequate production capacities.

## The State of RES in Poland

Coal, both hard (43%) and brown (26%), was still the most important fuel in Poland used for the generation of electricity in 2022. In comparison to year 2014, however, there was a notable decrease in their contribution to energy generation in 2021 (from 48% and 34%, respectively), mostly to the advantage

of RES (increase from 12% to 21%) (Fig. 1). According to some preliminary data, the share of RES in 2023 reached 27% (Derski, 2024).

There are countries in the European Union with an energy dependency ratio, which determines the share of imported energy sources in total energy consumption, of more than 90% (Cyprus, Luxembourg, Malta). The least dependent European country is Estonia (5%) (Pangsy-Kania & Wierzbicka, 2022, p. 93-94). In Poland in 2021, the rate was about 40% (Cierpiał-Wolan (supervisor) *et al.* 2023b). A clear answer to the question of whether Poland can achieve energy independence is difficult. An opportunity to achieve this goal is more dynamic development of RES. It is therefore not a goal that Poland will achieve in the coming years.

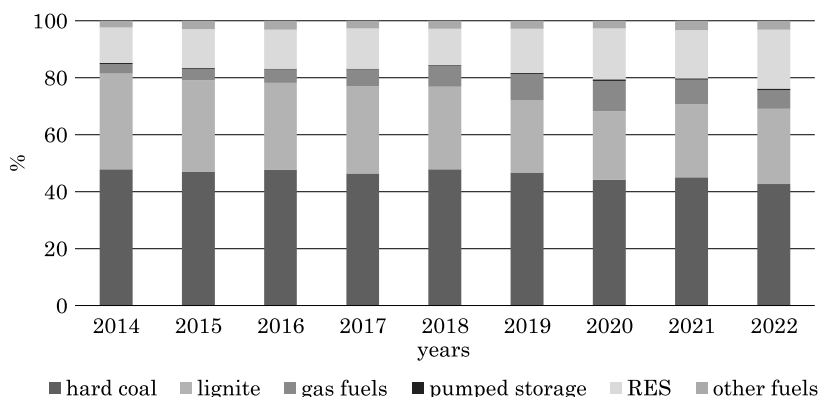


Fig. 1. Production of electricity according to carriers [%]

Source: based on Cierpiał-Wolan (supervisor) *et al.* (2023b).

As reported in the *European Electricity Review 2024* (2024), production of energy from RES in the EU-27 was record high (44%). This high increase was mostly contributed to by photovoltaic installations and wind farms (27%). Meanwhile, the lowest share of fossil fuels was recorded, and the contribution of RES to electric power production exceeded that of fossil fuels for the first time in history. This confirms the general trend of abandoning fossil fuels in favour of renewable energy sources.

The structure of RES-based energy production primarily depends on the country-specific geographical conditions, which explains why it is different in Poland than in the entire EU-27. For example, the highest contribution to energy generation from renewable energy sources in 2021 was made by: hydropower facilities in Slovenia (35% vs 1.6% in Poland, solar energy in Malta (61% vs 3.3% in Poland, heat pumps in Malta (36% vs 2.9% in Poland, wind energy in Ireland (56% vs 10.9% in Poland) (Cierpiał-Wolan (supervisor) *et al.*, 2023a).

Although solid biofuels dominated among RES in both Poland and the EU-27, they made up 69.4% in Poland and only 41.2% in the EU. An analysis of the structure in 2014 and 2021 demonstrated that the share of solid biofuels in Poland decreased (down by 6.7%) in favour of other RES carriers, especially solar power (up by 2.9%) and wind energy (up by 2.8%). As for the EU-27, an increase between these two years was observed in the contribution of heat pumps, wind power and solar power (up by 4.1%, 2.8%, and 1.5%, respectively). A comparison of the shares of particular energy carriers in Poland and in the EU-27 in the mentioned time period shows that Poland had a distinctly higher contribution of solid biofuels to energy generation (by 28.2% in 2021), but a much lower share of water energy (by 10.7% in 2021) (Fig. 2).

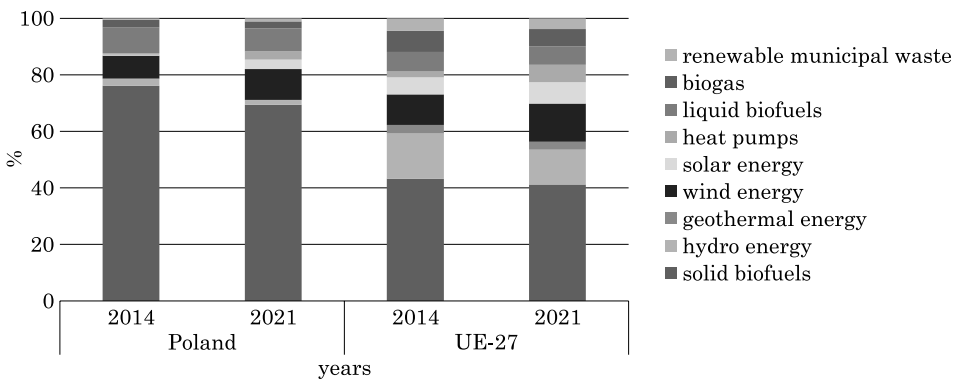


Fig. 2. Structure of energy production from RES (according to carriers) in Poland and in the EU-27 [%] in 2014 and 2021

Source: based on: Cierpień-Wolan (supervisor) *et al.* (2023a); Walkowska (supervisor) *et al.* (2019).

A priority issue from the point of view of achieving Poland's energy goals is the share of renewable energy sources in the production of electricity from renewable sources. In Poland, there was an evident increase between years 2014-2021 in the share of wind energy (up by 14.2%) and solar power (up by 12.6%), while that of solid fuels decreased (down by 25%). With respect to geothermal energy and liquid fuels, their contribution was close to 0%. In the European Union, an increase in the share of RES in energy generation was only observed for solar power (up by 4.4%) and wind power (up by 8%). When comparing shares of individual energy carriers in total production of electricity from renewable sources in Poland and in the EU-27, it became evident that the share of wind power and solid biofuels was much higher in 2021 (up by 16.7% and 12%, respectively), while that of hydropower was distinctly lower (down by 24.1%) (Fig. 3).

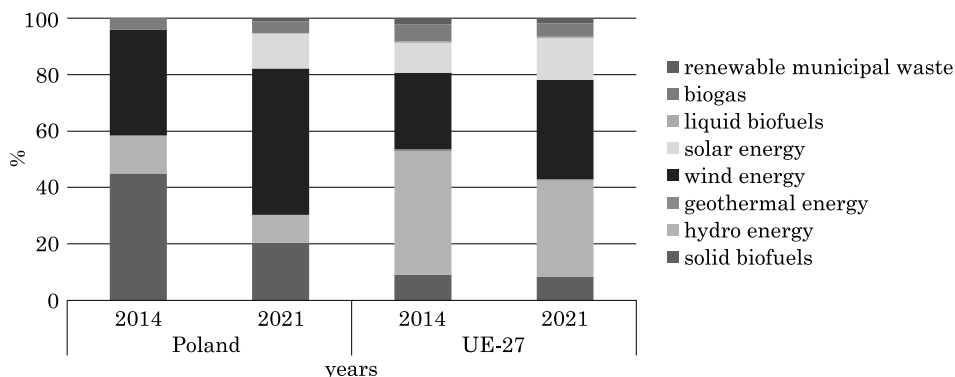


Fig. 3. Structure of electricity production from renewable energy carriers in Poland and in the EU-27 [%]

Source: based on: Cierpień-Wolan (supervisor) *et al.* (2023a); Walkowska (supervisor) *et al.* (2019).

A decline in the consumption of solid biofuels is a desirable trend because they are not an innovative or sustainable source of energy; they cause high emission of smog and can lead to deforestation (Lorek & Lorek, 2023, p. 114-131). The growth of wind and solar farms progresses under the strain of numerous barriers, such as legal, economic, technological and organisational obstacles, which are difficult to overcome (Sikora & Zimmiewicz, 2023, p. 456-475). Many authors point to several disadvantages of renewable energy sources, of which the one highlighted by Bielewicz is worth attention (2022, p. 20, 21): „the sun does not shine all the time or everywhere, and winds do not always blow”, which implicates the need to store energy. Moreover, some fuels (e.g. gas, atom), which used to be considered as harmful to climate, have now been accepted to be environment-friendly ones, mainly in the face of the war in Ukraine (Héjj & Sommer, 2023).

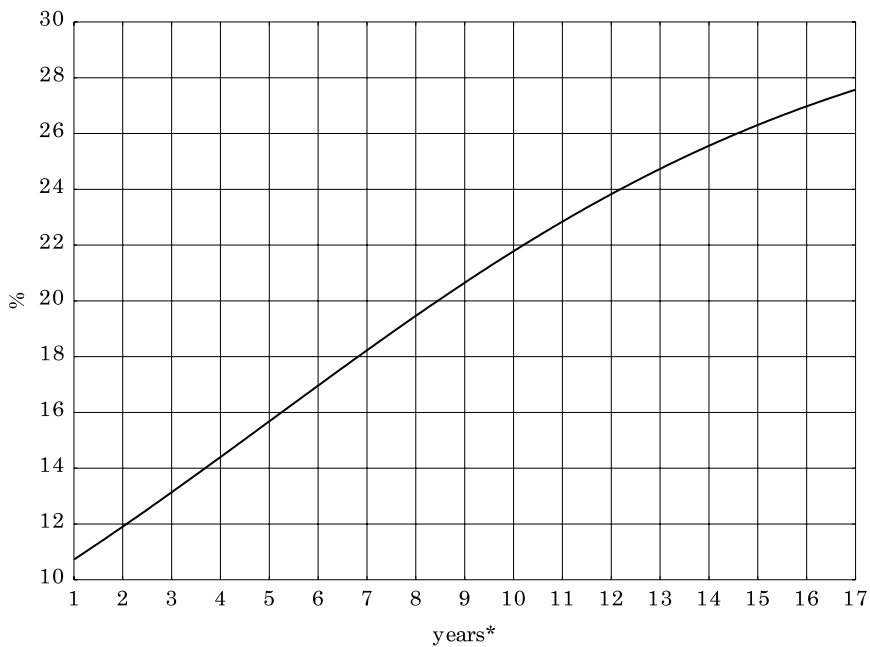
Unfortunately, the use of renewable energy in Poland differs greatly from the levels achieved in other EU-27 countries. This is confirmed by other scholars, e.g. Grzebyk & Stec, 2023, p. 244-264; Witkowska-Dąbrowska, 2018, p. 397-409. In conclusion, the first research hypothesis, H1: Although there is progress in the development of renewable energy sources in Poland, the Polish economy is significantly different in this regard from other EU economies, has been confirmed.

## Use of RES in Poland in 2030

For the purpose of this study, parameter  $a$ , which refers to the natural saturation level, was assumed to equal 31.5% because this is the goal set for Poland by the European Union. Based on data from years 2014-2023 regarding the share of RES in the sources of energy generation in Poland, and then, using

Statistica 13, a software statistical and analytical package, parameters  $b$  and  $c$  of the logistic function were calculated ( $b = 0,909$ ;  $c = -0,005$ ). The application of the logistic function enables us to identify development trends until 2030 according to the time series.

At the current pace of RES development in Poland (data for years 2014-2022 and preliminary data for year 2023 – from 1 to 10 on the cut-off axis), a steady increase in RES in all energy generation sources in Poland can be predicted. Until 2030, (17 on the cut-off axis), for which year Poland's goal is to achieve a 31.5% share of RES, the said percentage will reach barely 28% (Fig. 4).



\* 1–10: 2014–2023 – secondary data; 11–17: 2024–2030 – prognosis

Fig. 4. Perspective on changes in the share of RES energy in power generation sources  
Source: the authors, based on Cierpiał-Wolan (supervisor) *et al.* (2023b); Derski (2024).

Therefore, the second research hypothesis, H2: With the current rate of growth, the Polish economy is able to reach the goal set by the European Union, had to be refuted.



## Conclusions

The aim of the study, which was to determine the state of RES in Poland and determine the prospects for their further development based on it has been achieved. The research questions have been answered:

- in Poland, there is a trend away from conventional energy sources;
- the use of RES is increasing;
- at the current pace of development, Poland is unable to reach the 31.5% contribution of RES to energy generation until year 2030;
- Poland will be unable to secure energy independence in the near future;
- in Poland, solar and wind power generation is developing the fastest.

Two research hypotheses were verified. H1: Although there is progress in the development of renewable energy sources in Poland, the Polish economy is significantly different in this regard from other EU economies, was verified positively, while H2: With the current rate of growth, the Polish economy is able to reach the goal set by the European Union, had to be rejected.

The very high share of fossil fuels in Poland's energy mix has many negative consequences, among which the need to import them from outside the country's borders should be highlighted. By far the dominant supplier of raw materials to Poland is Russia. Poland is therefore not, firstly, energy secure, and secondly, energy independent. The importance of these aspects was highlighted by Russia's attack on Ukraine and the outbreak of the Russia-EU fuel war. The war in Ukraine has significantly affected the energy market.

The Polish economy is progressing in the right direction. The share of RES is increasing year to year, but the pace of changes is too slow. Legal restrictions do not aid the growth. However, it is worth bearing in mind that the structure of energy generation from RES and therefore the volume of energy harvested from each energy carrier depend first and foremost on the country-specific geographical conditions. Furthermore, Poland does not have a nuclear power plant, and plans to build one, which are put forth from time to time, are met with public protests.

The road to independence and energy security is a multi-track one. The second path, after RES, is nuclear power. As a consequence of numerous turbulences, among them the Chernobyl Nuclear Power Plant disaster, the implementation of the investment in Poland has not materialized so far. The difficult geopolitical situation, the real danger of an energy crisis and the increase in electricity prices have revived the discussion of nuclear energy development. It is worth recalling that the establishment of the European Atomic Energy Community (1957) laid the foundation for the construction of the European Union. Currently, 13 countries in the Community have nuclear power plants in operation. In 2022, nuclear power plants generated  $\frac{1}{4}$  of the total electricity produced in the EU (Sobolewski, 2020, p. 1-4).

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## A SYSTEMATIZATION OF MICRO-MOBILITY SAFETY IN SUSTAINABLE CITIES

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JEL Classification: R40, O18.

**Key words:** urban transportation systems, sustainable cities, micromobility, infrastructure, road safety.

### Abstract

The purpose of this analysis was to introduce the safety category to the general context of micromobility development in modern cities. The article is theoretical and is intended to introduce the safety category in micromobility. It focuses on the relatively young and attractive micromobility market in terms of greening socio-economic activities and development.

The micromobility market is receiving increasing attention from both citizens and city planners. The safety category was determined by: a) various internationally differentiated technical vehicle standards, b) micromobility users road accidents, c) cities transport infrastructure, and d) personal data of micromobility users. It was demonstrated that safety is an important issue in transport and city planning. The micromobility vehicles hold high significance in promoting sustainable development. Therefore, it is imperative to incorporate micromobility into sustainable urban mobility plans and incentivize individuals to change their mobility patterns. However, there is a need to observe the market because it is rather dynamic and more and more vehicles appear, also for elderly and people with physical disabilities. The emergence of novel technologies and vehicles has the potential to transform cities, thereby ensuring their safety and fostering a friendly environment for their citizens.

**KATEGORIA BEZPIECZEŃSTWA MIKROMOBILNOŚCI  
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Kody JEL: R40, O18.

Słowa kluczowe: miejskie systemy transportowe, zrównoważone miasta, mikromobilność, infrastruktura, bezpieczeństwo ruchu drogowego.

**Abstrakt**

Celem artykułu było wprowadzenie kategorii bezpieczeństwa w ogólny kontekst rozwoju mikromobilności we współczesnych miastach. Artykuł ma charakter teoretyczny. Uwagę skoncentrowano na relatywnie młodym i atrakcyjnym rynku w kontekście ekologizacji życia i rozwoju społeczno-gospodarczego.

Rynek mikromobilności cieszy się coraz większym zainteresowaniem, zarówno mieszkańców, jak i urbanistów. Kategorię bezpieczeństwa określono przez: a) techniczne standardy pojazdów, b) wypadki drogowe użytkowników mikromobilności, c) infrastrukturę transportową miast i d) dane osobowe użytkowników mikromobilności. Wykazano, że bezpieczeństwo jest interdyscyplinarną kategorią istotną w planowaniu transportu i rozwoju miast. Mikromobilność ma duże znaczenie w promowaniu zrównoważonego rozwoju, dlatego konieczne jest jej włączenie do planów zrównoważonej mobilności miejskiej i zachęcanie osób do zmiany wzorców mobilności. Rynek jest dość dynamiczny i pojawia się coraz więcej pojazdów, także dla osób starszych i z niepełnosprawnościami ruchowymi. Pojawienie się nowych technologii może sprzyjać rozwojowi miast bezpiecznych dla mieszkańców i środowiska.

**Introduction**

Cities face a variety of negative impacts from transportation: congestion (including traffic jams), greenhouse gas emissions, noise, and vibrations. These impacts have significant knock-on effects on the quality of life and health of city residents (Nadrian *et al.*, 2020, p. 4). Transportation fulfils a basic societal needs. The car is the most common mean of transportation, but also the one considered to be the least environmentally friendly. It should be noted that the transport modal split is a function of user demands and preferences (Dembińska, 2011, p. 16) – in this case, the high competitiveness of cars over other modes of transport (such as trains, ships or boats). Pursuing greener transport – including minimizing the modal share of cars in passenger transport – is one of the most important considerations in transport policy.

Recent years have seen the development of micro-mobile vehicles/means of transportation (MMVs), used for short trips in urban areas (Oeschger *et al.*, 2020, p. 2). The most popular of these are scooters and bicycles, often powered

by electric motors (e-scooters and e-bikes). O'Hern and Estgfaeller (2020, p. 18) point to the many socioeconomic benefits that micro-mobility offers as a mode of transportation. They also note the importance of technological advancement and the potential for new technologies that facilitate urban mobility (by virtue of their features and built-in motors). Similarly, Gössling (2020, p. 3) posits that electric MMVs are a highly attractive form of transportation in cities – one which can compete with walking, cycling and motorized transport.

The EU's long-term transport strategy aims to make Europe climate-neutral by 2050 (*Going Climate-Neutral...*, 2019). The relationship between transportation and climate neutrality is an area of particular interest, forming a core aspect of urban development. More and more cities are implementing and incorporating sustainable urban mobility plans (SUMP) into their decarbonization and CO<sub>2</sub> reduction strategies. The overriding goal of this approach is to improve the quality of life for residents while ensuring environmental sustainability. In this context, micro-mobility vehicles offer an environmentally-friendly transportation alternative that can mesh well with SUMPs (Christoforou *et al.*, 2021, p. 4). After all, they provide a way to quickly and easily cover short distances while circumventing congested roads, especially during peak traffic hours. As such, MMVs offer a highly attractive form of commuting that also happens to produce less CO<sub>2</sub>.

The growing demand for micro-mobiles is also shaped by sharing systems – pay-per-minute vehicle renting services. Given the attractiveness of micro-mobility, sharing systems may conceivably be integrated into urban public transit offerings going forward. If so, shared micro-mobility services would be subject to similar responsibility (area coverage requirements) and subsidized, as is the case for traditional urban public transport (*Urban Mobility Next...*, 2021, p. 6). Micro-mobility inscribes well into the desired model of urban transportation systems – zero-emission vehicles and a shift towards sustainable mobility patterns. As a further proof to the attractiveness of the European market, there has been growing investment into micro-mobility services. A McKinsey report (*How the Pandemic...*, 2023) shows the 2018-2022 value of public investments to be USD 8.4 bln, of which 29% were in Europe, 37% in Asia, 34% in North America. However, in the post-pandemic years of 2020-2022, almost 50% investments were made in Europe (approx. USD 1.9 bln).

The developments in vehicle technology and design, coupled with the growing demand for micro-mobility, speak to the need to build and modernize urban transport systems (including infrastructure) (Ma *et al.*, 2022, p. 18). Given the recent urban development trends, particular attention should be paid to providing residents with real and effective options to fulfill one of their basic needs – that of mobility (Coughlin, 2009, p. 6). The present article examines the challenges facing the development of micro-mobility in today's urban landscape, with particular focus on safety as an interdisciplinary category. It also analyzes selected aspects of the safety of micro-mobility as a sustainable form of urban

transport: the formal and legal classification of micro-mobility vehicles, modes of use, road infrastructure, and user data safety. Data are presented relating to traffic accidents involving micro-mobility vehicles in Poland. The analysis aims to systematize aspects of safety in theoretical terms.

## MMVs – Safety and Classification

There have been many definitions and classifications of micro-mobility vehicles posited internationally (globally). For example, the Society of Automobile Engineers (SAE) describes micro-mobility vehicles as human-powered or powered by an electric motor, with a weight smaller than 500 kg (Tab. 1). In most cases, only one person can steer and use the vehicle due to safety rules and vehicle design. MMVs are allowed to be used on designated paths (such as bikeways) or on paths shared with other users (such as bicycles and scooters on bikeways, or roller skates and skateboards on pedestrian paths).

Table 1

MMV classification according to SAE

Type of vehicle	Description of the vehicle
Powered bicycle	has a handlebar, pedals, two or three wheels and a handlebar, can be exclusively or partially powered by an electric motor
Powered non-self-balancing board (e-board, e-skateboard)	no handlebar, controlled by an operator through a handheld device or via floorboard sensors
Powered self-balancing board	has a handlebar, one or two parallel wheels, floorboard or footpegs for the user with a handlebar on a central column, exclusively powered by a motor/engine (electronic devices/means of mobility)
Powered skates	a motor-powered double-unit vehicle, with one unit for each foot
Seated electric scooter	a non-pedaled vehicle with two or three wheels, a handlebar, floorboard and/or footpegs, and a seat (for the user and passenger), exclusively or partially powered by a motor
Electric scooter (e-scooter)	has a handlebar, floorboard for the user (and passenger), two or three wheels, exclusively or partially powered by a motor

Source: based on *Taxonomy and Classification...* (2019).

The International Transport Forum (ITF/OECD) has put forward a classification of vehicles by maximum speed and weight (Tab. 2). It divides personal mobility vehicles into 4 groups, incorporating both muscle-powered and engine/motor-powered (including hybrid systems).



Table 2

Classification of micro-mobility vehicles according to ITF

Vehicle group	Propulsion	Maximum speed	Weight	Examples
A	unpowered or powered	less than 25 km/h	less than 35 kg	bicycle, pedal assisted bicycle, scooter, e-scooter, monowheels (powered and self-balancing)
B			35-350 kg	scooters designed for elderly or disabled people – mobility scooters
C	powered	25-45 km/h	less than 35 kg	e-bike, e-scooter, motor scooters
D			35-350 kg	motor scooters

Source: *Safe micro-mobility* (2019, p. 16).

The growth of the European market led to a separate category being delineated for MMVs – Category L. Pursuant to Regulation (EU) No 168/2013, the category includes 2-, 3- and 4-wheelers. Notably, however, the Regulation does not extend to vehicles most often used by citizens for short trips, including:

- those with a speed of 6 km/h or less,
- bikes with a pedal assisted speed of 25 km/h,
- self-balancing vehicles,
- vehicles equipped with a seating position (seated scooters).

The Regulation introduces technical safety standards for vehicle features (e.g., braking systems, lighting systems, audible warning devices, tires), design and approval (manipulation prevention safeguards, dimensions and weights, handlebars and footpegs), as well as environmental and motor specifications (Regulation (EU) No 168/2013, p. 94). These requirements are necessary to ensure the safety of travelers. Still, the EU classification differs from that proposed by the SAE or ITF. This speaks to the wide variety of micro-mobility vehicles in terms of design and function, which may mislead users crossing international borders (including tourists) and make the use of vehicles problematic or, in extreme cases, impossible.

The technical standardization of vehicles is crucial to establishing safety rules and, in the case of MMVs, developing tools to drive uptake and promotion of MMVs as a sustainable alternative for urban travel (*Safe Micro-Mobility*, 2020, p. 15). There is a wide range of MMVs available, which means that infrastructure and safety regulations need to be adapted to all possible vehicles and traffic participants.

Another key priority for vehicle safety is to develop a diverse offer adapted to the needs of various social and age groups. Contemporary social trends, including population ageing, merit particular attention in this regard. Indeed, it is highly likely that products designed for older people will soon become more common (Gitelman *et al.*, 2016, p. 3; Isaacson & Barkay, 2020, p. 4). Mobility scooters and wheelchairs, equipped with extra features to accommodate older

people and/or those with reduced mobility, are an increasingly common sight in urban spaces. Such vehicles can range from 2-, 3- to 4-wheelers, and require special adaptations to ensure greater stability, accessibility, and driver safety, as well as additional electrical systems and other features (Phannil & Jettanasen, 2021, p. 4). These types of products help counteract social exclusion and provide more opportunities for non-assisted living (Cirella *et al.*, 2019, p. 2), with their primary function being to enable and support quick and safe motility while fulfilling basic needs.

## Safety and Urban Transport Infrastructure

Without infrastructure that meets the quantitative and qualitative growth in demand, real sustainability of urban mobility will remain out of reach. Infrastructure planning (including length and width of pedestrian routes, bikeways and designated lanes for specific vehicles) is a key part of urban development, especially in terms of enabling safe daily travel for residents.

Without investment in infrastructure, the proliferation of MMVs will lead to increased traffic on pedestrian routes and bikeways in the long run. This, in turn, could make micro-mobility a less appealing mode of travel. From an urban governance standpoint, diverting daily commute from cars to environmentally friendly MMVs is a problematic proposition. Thus, there is an urgent need to modify the urban transportation infrastructure to accommodate the burgeoning micro-mobility options, including by: creating accessible paths and roads dedicated to specific MMVs, establishing safe passageways, removing potentially hazardous obstacles, and finally – allocating secured parking spaces that do not interfere with pedestrian movement and other traffic (Isaacson & Barkay, 2020, p. 5).

There are certain difficulties in obtaining data on urban accidents and determining black spots (highly dangerous places with relatively elevated accident rates). In some cases, data can be obtained from mobile providers or shared micro-mobility operators (*Road Safety Annual...*, 2023, p. 18). Data on travel vectors and frequency coupled with accident locations are particularly valuable from a traffic safety standpoint, as they can be drawn upon to establish a safer urban mobility infrastructure. The ability to generate data from operators of sharing systems would make it possible to identify black spots in transport infrastructures. However, police statistics on accident locations are difficult to access, due to the lack of publicly available statistics (rates and severity of accidents on a street-by-street basis). Such data would be valuable and useful, making it possible to introduce technical and infrastructural solutions or shaping the behavior of MMV users.

A wide range of MMVs (see Tables 1 and 2) are available for use by individuals or shared micro-mobility operators. In other words, vehicles can be bought for private use or rented from a shared service. Of the latter, e-scooters and e-bikes

(including public bike rentals) are the most popular choices for city dwellers. Depending on the operator's particular arrangements with the city, shared MMV systems can be based around rent/return zones (mobile points that serve as special "parking" areas), or rentals without designated mobile points (the vehicle can be anywhere within the area designated by the operator) (Moran *et al.*, 2020, p. 663). Regardless of the rental scheme, safety should be made a priority, and creating parking spaces for micro-mobility vehicles would seem to be a central consideration in this regard. It is essential to designate safe parking zones, adapt mobile points, and provide vehicle docking facilities. A "quick repair" zone with free-to-use tooling is also a valuable part of mobile points. Another consideration is incorrectly parked or abandoned vehicles, which significantly increase the risk of accident for all traffic participants, including pedestrians. Finally, particular focus should be put on transportation infrastructure to offset the increased accident risk posed by the large number of micro-mobility users – which is very likely to grow going forward – and the ever-wider range of vehicles (Comi *et al.*, 2022, p. 25).

An important aspect of traffic safety is the behavior of the traffic participants themselves. In a study by Lanza *et al.* (2022), 45% of dog walkers and 33% e-scooter users were found to stray from their designated infrastructure. Furthermore, the majority of runners (56%) and walkers (51%) did not use the recommended infrastructure. This is a major issue, as crossing into traffic routes intended for other users can increase accident risk. E-scooters and e-bikes move at much higher speeds compared to other vehicles and pedestrians. Straying or using the "wrong" road may lead to a tragic accident. It thus follows that safety is also predicated on awareness among traffic participants and observing good road etiquette.

## Safety in Numbers – Traffic Accidents

Basic data on traffic accidents are publicized via police statistics, whereas more detailed information (on the severity of accidents) is available in hospital statistics. In some countries, data are also reported on commune level (*Safe Micro-Mobility*, 2020, p. 69), though access is more difficult in this case.

Cloud *et al.* (2023, p. 7-12) found a significant relationship between shared e-scooter services and road safety. Variables analyzed in the study included bike-lane density and vehicle rates (cars per 1,000 inhabitants) from 93 UE cities. It was found that:

- a) since the rollout of e-scooter services, the average number of accidents involving personal injuries increased by approx. 8%;
- b) traffic rates were higher during summer;
- c) high bike-lane density was correlated with accident rates – the higher the density of the bikeway network, the lower the number of accidents.

The International Transport Forum (ITF) showed that road fatalities decreased in 2022 compared to the average for 2017-2019 (*Road safety Annual...*, 2023, p. 16) – the pre-pandemic period. Cyclist fatalities decreased by 3.3% during this time. Notably, the report refers to the increasing popularity of e-bikes among urbanites and adverse changes in accident patterns. Of concern are the increased shares of fatal e-biker accidents, observed in countries such as Japan (60% of all accidents), Germany (44%) and the Netherlands (34%) (*Road Safety Annual...*, 2023, p. 18). ITF data also show that travelling by a powered two-wheeler is 5 times less safe than by a non-powered MMV (*Urban Mobility Next...*, 2021, p. 11).

In Poland, data on accidents involving micro-mobility vehicles is publicized in traffic accident reports by the Komenda Główna Policji (National Police Headquarters). Until 2022, the reporting only recorded micro-mobility accident data for bikes. Of course, the statistics also included groups of “other vehicles” and “undetermined vehicles” – designations which may refer to vehicles not defined by the Kodeks drogowy (Traffic Code), including micro-mobiles. Recent amendments to the Ustawa Prawo o ruchu drogowym (1997 Road Traffic Law) have made it possible to define, and thus statistically report on, other micro-mobility vehicles/modes of transport, including:

- non powered personal mobility devices (UWR – urządzenia wspomagające ruch), designed to be ridden standing up (p. 5); which include: scooters, roller skates, rollerblades, skateboards;

- electric-powered personal transporters (UTO – urządzenia transportu osobistego), non-seated and non-pedaled, designed for one person only (p. 10); which include: electric skateboards;

- electric scooters – electric-powered, two-axled vehicle, non-seated and non-pedaled, designed for one person only (without other passengers); under Polish legislation, an e-scooter is not a UTO (p. 10).

Police statistics show that the rates of accidents due to cyclists in Poland decreased from 2013 to 2023 (Fig. 1). Of note is that the biggest drop occurred during the COVID-19 pandemic. There has been a marked increase since 2022, but the rates are still below those recorded before the pandemic. Since other MMVs started to be included in the statistics, the overall number of accidents has been increasing (by approx. 17 percentage points).

It stands to reason that there may be a positive relationship between the number of available MMVs and accident rates. It seems that the development of infrastructure has not kept step with the growth of the MMV market. The patterns are somewhat similar to those of private motorized transport – after all, the more cars there are on the road, the greater the likelihood of traffic incidents. Conversely, a well-funded and safe infrastructure reduces accident rates. Poland has seen declining numbers of accidents – especially fatal accidents – since the focus in transportation investment has shifted to expressway and highway expansion.

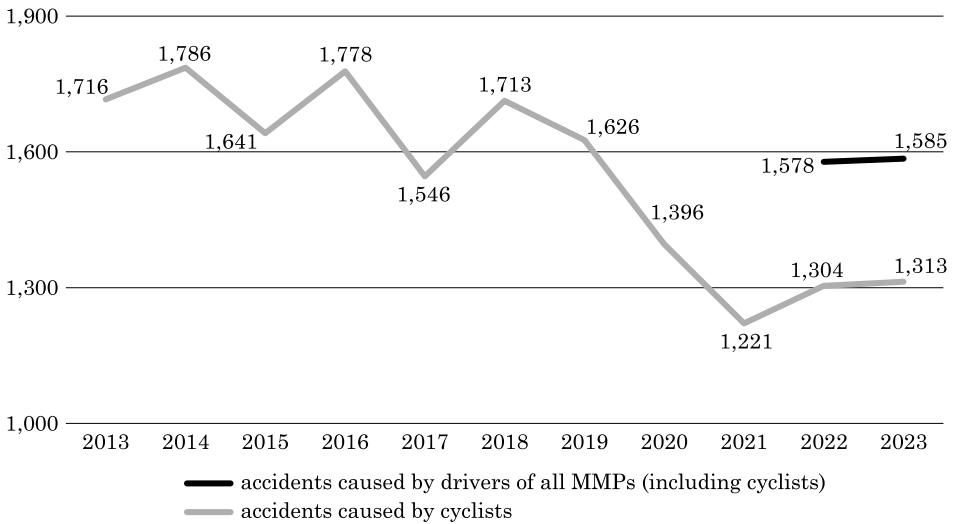


Fig. 1. Number of accidents by MMV of person responsible – data for 2013-2023  
Source: based on *Wypadki drogowe w Polsce...* (2014-2024).

## MMV user Data Security

Geopositioning data could be useful for profiling major movement trajectories, establishing convenient locations for mobile points, and creating infrastructure for docking systems. However, cities tend not to archive such data, and operators are rarely willing to part with them (Moran *et al.*, 2020, p. 12). Micro-mobility data sharing schemes would certainly contribute to the growth and uptake of micro-mobility vehicles as a real alternative to passenger cars (*Urban Mobility Next...*, 2021, p. 8). Such data are often carried by mobile phones, often used to access shared services. Some operators gatekeep their services behind credit card registration requirements. Schumann *et al.* (2023) report the possibility of using passive data generated for the development of micro-mobility, including data from fixed sensors (e.g., digital cameras and counters) and mobile sensors (data from mobile phones and GPS systems). Harari (2020) highlights the problems of privacy protection and data security (including data on habits or personality traits), including:

- how secure are user data,
- which data are used and which are shared,
- who uses them and for what purpose?

Data generated for micro-mobility purposes can be a valuable source of information, used by operators managing public space and transportation in cities for purposes such as accessibility planning, lawmaking and enforcement (ensuring the safety of micro-mobility users and urban traffic participants)

(Chitturi & Puentes, 2023, p. 12, 13). On the other hand, there are concerns that personal data can be stolen. Operators can obtain data only to the extent provided by the privacy policy and personal data protection rules (see Tab. 3). The data can be provided by users, collected automatically when using service access applications, or sourced from external companies (based on user interactions with the service provider). Data is most commonly stolen from users' phones and the operators' data cloud. Finding vulnerabilities allows operators to introduce safeguards on their end to protect customer data from possible interception by unauthorized parties. However, micro-mobility users (phone owners themselves) must also commit and do their part to protect their own data.

Table 3

Types of user data acquired under privacy policies (according to operators)

Operator	User-provided data				Data collected automatically by operator			Data from external sources (Facebook, Google, etc.)
	contact info	billing info	Identification info	demographic info	device info	location and vehicle info	analytics	user interactions related to the service provider
Bird	✓	✓	✓	✓	✓	✓	✓	✓
Lime	✓	✓	✓	✓	✓	✓	✓	✓
Razor	✓	✗	✓	✗	✓	✓	✓	✓
Lyft	✓	✓	✓	✓	✓	✓	✓	✓
Jump	✓	✓	✓	✓	✓	✓	✓	✓

Source: based on Vinayaga-Sureshkanth *et al.* (2020, p. 4).

## Conclusions

MMVs are certainly an asset that can be incorporated into green city strategies. Micro-mobility is an important facet of SUMP in cities that also aspire to be friendly and, above all, safe places to live. The systematization of safety is, in this case, an interdisciplinary effort. Safety vis-a-vis micro-mobility extends to:

- responsible conduct of users, including as regards data protection,
- infrastructure accessible to all social groups and their vehicles,
- data obtained by operators,
- formal and legal measures to foster improvements in traffic safety (roadworthiness standards and traffic rules).

Micro-mobility is a challenge for modern cities. Nevertheless, it also falls perfectly in line with the push towards SUMP and greener transportation. New MMVs are introduced as the technology advances, and safe infrastructure needs to be established to keep up. On the one hand, the demand for MMVs (private and shared) is rising, on the other, this coincides with increased accident rates. Micro-mobility can be a boon for cities willing to harness it for sustainable development and greener transportation. MMVs are increasingly in demand and highly popular, and this trend may help effect a real shift in the modal split of urban travel towards clean and zero-emission vehicles. The achievement of this goal can be facilitated by ensuring conditions for growth. And indeed, safety is one of such conditions, the provision of which will pose a major challenge and organizational/financial effort for cities.

The purpose of this paper was to serve as an introduction to systematization of micro-mobility safety and to highlight selected aspects thereof. The author acknowledges that aspects of MMV safety are broader still, including security of operating systems (hacking attacks affecting GPS coordinates, motors and braking systems), regulations on active and passive safety of MMV users and other traffic participants, accident severity or “economics” of safety (taking into account external costs of accidents involving MMVs) – aspects which can serve as a jumping-off point for further considerations and research on the safety of urban micro-mobility.

Translated by Joanna Molga

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## THE EFFECTS OF CITIES' MEMBERSHIP IN THE CITTASLOW NETWORK IN THE OPINION OF THEIR RESIDENTS: THE EXAMPLE OF BARCZEWO AND BISKUPIEC

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### Abstract

The aim of the research was to assess the effects of cities' membership in the Polish National Cittaslow Network based on the opinions of their residents. An attempt was made to identify both positive and negative effects felt in cities and to determine in which areas they occur most. The study used the survey research method. The survey questionnaire was addressed to residents of two slow cities: Biskupiec and Barczewo. Most respondents indicated positive effects of membership in the Cittaslow network. The most benefits were indicated in three areas of the city's functioning: increased tourist attractiveness, expanded cultural offer of the city and better promotion of the city. Importantly, the majority of respondents support the city's continued membership in the network and believe that it will accelerate the economic growth rate and the city's long-term development.

**EFEKTY PRZYNALEŻNOŚCI MIAST DO SIECI CITTASLOW W OPINII  
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Kody JEL: O19, O20, O21.

Słowa kluczowe: miasta *slow*, sieć Cittaslow, efekty członkostwa, badanie opinii mieszkańców.**A b s t r a k t**

Celem badań była ocena efektów członkostwa miast w Polskiej Krajowej Sieci Miast Cittaslow na podstawie opinii ich mieszkańców. Podjęto próbę identyfikacji zarówno pozytywnych, jak i negatywnych efektów odczuwanych w miastach oraz określenia, w jakich obszarach jest ich najwięcej. Wykorzystano metodę badań sondażowych. Kwestionariusz ankiety skierowano do mieszkańców dwóch *slow cities*: Biskupca i Barczewa. Większość ankietowanych wskazała na występowanie pozytywnych efektów członkostwa ich miasta w sieci Cittaslow. Najwięcej korzyści wskazano w trzech obszarach funkcjonowania miasta: wzrost atrakcyjności turystycznej, poszerzona oferta kulturalna i lepsza promocja miasta. Co ważne, większość ankietowanych popiera dalsze członkostwo miasta w sieci i uważa, że wpłynie to na przyspieszenie tempa wzrostu gospodarczego oraz długofalowy rozwój miasta.

**Introduction**

Modern cities face many problems of an economic, social and spatial nature and, moreover, they operate in a very dynamically changing environment, which forces them to look for an optimal development model. The answer to this challenge is the slow city concept, which draws attention to improving the quality of life in the city and sustainable development based on local resources. It is an alternative concept of city development that promotes the culture of good and unhurried life.

The concept of slow city was born in Italy from the concept of slow food, initiated by Carlo Petrini, who was outraged by the creation of a McDonald's restaurant on the Spanish Steps in Rome. The originator of the idea to create the Cittaslow network, i.e. a network of cities that would like to develop in accordance with the assumptions of the slow city concept, was Paolo Saturini, mayor of the small Italian town of Grave di Chanti. Together with the authorities of three other cities: Bra, Orvieto and Positano, he initiated the creation of the Cittaslow network

in 1999, which was quickly joined by other Italian cities. In order to legally regulate the functioning of the network, in the same year an association called “Cittaslow – International Network of Cities of Good Life” was established, which is a non-profit organization aimed at promoting and disseminating the culture of good life.

The slow city concept has found and still finds many supporters, not only in Italy, but all over the world. The international Cittaslow network currently includes (June 2024) 301 cities from 33 countries. Small and medium-sized cities with a population not exceeding 50,000 can become members of the network. Cities are initially accepted into the international network, and then create a national network. In Poland, this is the Polish National Cittaslow Network.

Membership in the Cittaslow network is perceived by cities as an opportunity for their development and improvement of the quality of life of their residents. Cities hope to achieve benefits in various spheres: economic, social, natural, spatial, organizational and image, so they are willing to engage in activities consistent with the assumptions of the slow city concept. They undertake numerous initiatives in the field of environmental protection, tourism, development of public space, education and social integration. They engage in cooperation within the network and joint promotional activities (Wierzbicka, 2021, p. 912). Importantly, some effects of the actions taken may be visible shortly after joining the network, while others may have to wait at least a dozen or so years for cities to see them. Due to the above, an attempt to assess the effects achieved by selected Polish cities in connection with their membership in the Cittaslow network was considered important and interesting.

The aim of the research was to assess the effects of cities' membership in the Polish National Cittaslow Network based on the opinions of their residents. An attempt was made to identify both positive and negative effects felt in cities and to determine in which areas they are most abundant. These effects were analysed in the following areas of the city's functioning: local entrepreneurship, labour market, tourism, integration of residents, cultural offer, spatial development, protection of the natural environment, city promotion, quality of life in the city. The research was conducted among residents of two selected slow cities – Biskupiec and Barczewo. Both cities are located in the Warmian-Masurian Voivodeship. Biskupiec is one of the founding cities of the Polish network, so it has been a member of it for over 15 years, while Barczewo joined the network in 2013, six years later.

The following research question was formulated in the work: In what areas of the city's functioning are the greatest benefits from membership in the Cittaslow network felt? An attempt to answer the research question formulated in this way was formulated in the form of the following research hypothesis: *Membership in the Polish National Cittaslow Network brings the most benefits to cities in the area of promotion.*

## Research Methodology

The research was conducted using the diagnostic survey method. The survey questionnaire was distributed to the inhabitants of the selected cities in two ways: directly, by the Author conducting the survey on the streets of the selected cities, and indirectly – via the social media of the researched cities. The survey questionnaire contained 19 closed questions and one open question in which the respondent could share his or her opinion on the subject under study. The questions contained in the questionnaire concerned the respondents' knowledge of the Polish National Network of Cittaslow Cities, the city's membership of the network and the effects of that membership. Respondents were asked to state whether they had observed changes in the above-mentioned areas of the city's functioning and what their degree of impact was. For these types of questions, a Likert scale was used to collect relevant qualitative data. The study was conducted in the period from January 5, 2023 to March 13, 2023 and concerned the effects achieved throughout the entire period of the city's membership in the Cittaslow network. The collected primary data was analysed using ratio analysis.

## Literature Review

The Polish Cittaslow network was established in 2007. The founding cities of the network were four cities located in the Warmian-Masurian Voivodeship: Biskupiec, Bisztynek, Lidzbark Warmiński and Reszel. The Marshal's Office of the Warmian-Masurian Voivodeship in Olsztyn became a supporting member of the network. The Polish National Network of Cittaslow Cities currently includes 38 cities, including 28 from the Warmian-Masurian Voivodeship: Barczewo, Bartoszyce, Biała Piska, Braniewo, Biskupiec, Bisztynek, Działdowo, Dobre Miasto, Głubczyce, Golub-Dobrzyń, Gołdap, Górowo Iławeckie, Jeziorany, Kalety, Kisielice, Lidzbark, Lidzbark Warmiński, Lubawa, Morağ, Murowana Goślina, Nidzica, Nowe Miasto Lubawskie, Nowy Dwór Gdański, Olecko, Olsztynek, Orneta, Pasym, Prudnik, Rejowiec Fabryczny, Reszel, Rzgów, Ryn, Sępól, Sianów, Sierpc, Szczytno, Węgorzewo, Wydminy . The member cities of the Polish Cittaslow network are very diverse. They differ in terms of size, natural and cultural values, as well as socio-economic potential (Janusz, 2018, p. 71-82; Jaszczak & Kristianova, 2019, p. 1-9; Konecka-Szydłowska, 2017, p. 61-73; Senetra & Szarek-Iwaniuk, 2020, p. 1-15; Wierzbicka, 2023, p. 32-41).

The aim of the Polish National Cittaslow Network is to promote and disseminate the idea of a good, harmonious life. The activities of cities cooperating in the network focus on improving the quality of life of residents using valuable, endogenous resources, while striving to maintain the unique character of each of them (Radstrom, 2011, p. 90-113; Hatipoglu, 2015, p. 20-36; Perano *et al.*, 2019, p. 195-203). Cities belonging to the network focus on pro-social and

pro-environmental activities. They try to cultivate traditions and at the same time use innovative ways of organizing the city so as to maintain a balance between development and a quiet pace of life (Strzelecka, 2018, p. 56, 57; Tocci, 2018, p. 110-128).

By adopting the assumptions of the slow city concept and joining the Cittaslow network, cities hope to achieve benefits resulting from both the network membership itself and the cooperation of cities. However, how quickly these benefits will be visible and what their degree of impact will depend on the specificity of a given city, as well as many conditions, both endogenous and exogenous (Farelnik *et al.*, 2021, p. 157).

According to A. Gruszecka-Tieśluk (2013, p. 389, 390) the most important benefits that Cittaslow network member cities can achieve are:

- cross-linking,
- determining the direction of development,
- city promotion.

Cittaslow gives member cities the opportunity to present themselves online at both local and international levels. Networking enables building an aware community and local uniqueness. Cities cooperate with each other and draw on each other's experiences, but importantly, they do not thoughtlessly imitate the behaviour of other network members. Membership in the Cittaslow network is a kind of development guide for cities, which suggests how to properly stimulate the development of the city and the region. Membership in the network is also the promotion of the city, the promotion of a place where you can live well and where it is worth coming to relax, because time passes slower here and there is a friendly atmosphere. A. Szczepańska and K. Pietrzyk (2018, p. 262) emphasize that membership in the association itself is a positive effect, as it allows the use of the Cittaslow brand and logo, and also allows participation in events organized for network members (e.g. international conferences), allows access to innovative ideas or solutions developed, for example, during workshops.

According to P. Szarek-Iwaniak (2019, p. 16), membership in the Cittaslow network significantly influences the development of a given settlement unit and allows for increasing the development opportunities of cities, among others through:

- possibility of being present on many levels;
- exchange of experiences in city management and taking actions;
- cooperation in the promotion of the movement/brand;
- defining a vision for the development of the network, taking into account the individual potential of member cities;
- building regional identity and inhabitants;
- assistance in the development of smaller cities with lower development potential;
- joint implementation of projects aimed at improving the standard of living;
- possibility of receiving financial support, e.g. from European funds.

Similar benefits are also noticed by E. Strzelecka (2017, p. 36), who emphasizes that membership in the network enables cities to shape a common development framework based on "real life" values. Mentioning the importance of building partnerships with residents and their identity, she cites as an example the organization of annual events such as Cittaslow Sunday, and since 2017, Cittaslow Week. She emphasizes that the Supra-local Cittaslow Revitalization Program of the Warmian-Masurian Voivodeship is an important socio-economic undertaking. It is a document assuming coordinated and targeted urban revitalization. Its goal is to fight poverty, support social inclusion, improve the quality of life in problem areas and improve the tourist offer and cities' attractiveness (Galibarczyk, 2017, p. 119).

Cities hope to achieve benefits in various areas, for example (Wierzbicka, 2022, p. 3, 4; Zawadzka, 2017, p. 99-101):

- economic,
- social,
- nature,
- spatial,
- image.

W. Wierzbicka (2022, p. 3, 4) emphasizes that when it comes to the natural (environmental) sphere, cities have a chance to achieve effects such as improving the quality of the natural environment, sustainable development of the city or increasing the use of alternative energy sources.

Membership in the Cittaslow network is perceived by cities as an opportunity for their development and improvement of the quality of life of their residents. The potential effects of accession to the Cittaslow network include (Erdogan, 2016, p. 244):

- benefits resulting from the cooperation of cities within the network;
- setting directions for sustainable development of the city based on the list of mandatory certification criteria;
- city promotion;
- building awareness among residents of the city's resources and strengths;
- co-financing from EU funds;
- higher revenues from tourism.

According to E. Farelnek, A. Stanowicka and W. Wierzbicka (2017, p. 421, 422) in addition to the previously mentioned benefits, cities can also achieve such benefits as:

- an increase in the inhabitants' satisfaction with living in the city and, consequently, e.g. a decrease in the scale of migration;
- increase in demand for products and services, which increases the investment attractiveness of the city;
- increase in investment, which will provide residents with new jobs and higher incomes;



- economic growth and development of the city made possible by stable internal demand and investments;
- increase in the city's attractiveness as a tourist destination, which will stimulate further economic growth;
- creation of a clear and desirable image of the city, which will further improve the city's competitiveness.

The latter benefit is very often emphasised in the literature. This is because towns cooperating with each other have the opportunity to carry out more effective promotion and increase the prestige of the towns, for example by using the Cittaslow logo. Cities organise joint promotional activities such as festivals and workshops, which not only promote the cities, but also strengthen cooperation within the network, foster the exchange of know-how, ideas and good practices (Wierzbicka, 2021, p. 910). An example of such activities is, for example, the participation of cities in the annual international competition "Chiocciola Orange" for the best practice in the Cittaslow network. The promotion of Cittaslow towns is intended to show that life in a small town is good because it is close to nature, high-quality products, strong local communities and a friendly atmosphere. The common image of 'good life' towns is supposed to be an impulse that revitalises the economy and the activity of the inhabitants, it is supposed to allow small towns to 'appear', improve their competitiveness and economic situation (Szczepańska & Świdorski, 2017, p. 159).

As emphasised by many authors, membership in the Cittaslow network is also supposed to help cities in obtaining EU funds – this is referred to, for example, in the Tourism Development Strategy of the Warmian-Masurian Voivodeship until 2025 (Szczepańska & Pietrzyk, 2018, p. 262). Membership in the network is supposed to be an asset for the city when applying for funding, as it is a sign that the city has a coherent development concept and actively seeks opportunities for promotion and socio-economic development (Szczepańska & Świdorski, 2017, p. 158). Cooperation between authorities and local stakeholders (private as well as public entities) can strengthen the development of cities (Zadęcka, 2018, p. 103), accelerate their economic growth, help reduce poverty, and implement innovative economic projects (Strzelecka, 2017, p. 35).

Membership of the Cittaslow network is an important factor that can positively influence the development of the tourism potential of small towns (Treutle, 2017, p. 260). The effect of towns' membership in the network can also be the restoration and revitalisation of old town centres and monuments (Lewandowska *et al.*, 2019, p. 566). According to W. Pawłowski and E. Strzelecka (2017, p. 7) it is the city centres (especially historic cities) that should play a leading role in creating the tourist attractiveness of slow cities.

"According to the authorities of the cities belonging to the network, the most important effects of membership, already visible in some cities, are: more effective promotion of the city, revitalisation and activation of certain areas of the city, obtaining additional sources of financing for investments and improving

the aesthetic value, quality and accessibility of public space in cities” (Farelnik *et al.*, 2021, p. 157). The introduction of modern technological solutions in cities, the practical use of the historical fabric and the uniqueness of cities are also visible. There is also a change in human behaviour, an increase in tourism, high standards of hospitality and an expansion of the cultural offer. Residents are beginning to see the potential of their surroundings and the possibility of financial gain, and they recognise the many measures being taken in the city to improve quality of life (Szczepańska & Pietrzyk, 2018, p. 262-263).

When talking about the benefits of cities becoming members of the Cittaslow network, it is also worth mentioning some of the negative effects that may accompany this. The most frequently mentioned are (Wierzbicka, 2021, p. 908):

- the need to pay an annual membership fee,
- the misunderstanding of the slow city concept and thus the identification of network cities with open-air museums, backward cities or slow cities,
- homogenisation of cities,
- increasing number of tourists attracted by improving the tourist attractiveness of a city.

Cities belonging to the Cittaslow network are perceived by some as open-air museum towns and are wrongly identified with lazy or backward cities (Zadęcka, 2017, p. 170). The idea of Cittaslow, whose hallmark is the snail, is wrongly associated with laziness and slowing down, whereas it should be associated with calm but modern living. This misunderstanding of the slow city idea is due to the cultural difference between Poland and Italy, the cradle of the movement. According to M. Szczepańska and A. Świdorski (2017, p. 159, 160), in Italy the idea of slowing down the pace of life fits perfectly with a lifestyle in the spirit of ‘vita lente’. In Poland, on the other hand, technological development, increased consumption and living standards are still followed, which for many seems to contradict the idea of slow and the snail logo. This is why Poland’s lack of readiness for solutions aimed at slowing down the pace of life is sometimes mentioned.

A disadvantageous effect of network membership may also be the homogenisation of cities, i.e. the similarity of cities to each other, which may result from the fact that all network cities are based on mutually duplicated elements of development (Szczepańska & Pietrzyk, 2018, p. 263).

A threat arising from membership of the Cittaslow network may also be the increasing number of tourists, which may disrupt the development of the town, negatively affect the environment or over-saturate town centres, giving them a commercial character (Grzelak-Kostulska *et al.*, 2011, p. 189-191). An increase in the number of tourists can contribute to the loss of attractiveness of a place, disrupt the development of an area and lead to the disruption of social ties (Szczepańska & Pietrzyk, 2018, p. 262, 263).

The mayor of one of the founding cities of the Polish Cittaslow network, namely Lidzbark Warmiński – Mr. Jacek Wiśniowski in an interview concerning

the effects of joining the Cittaslow network points out that there are certain threats in the context of the long-term development of the slow cities. He stresses that in order to avoid these risks, a member city must have strong foundations, i.e. a vision of development based on proven resources and a thorough analysis of strengths and weaknesses (Strzelecka, 2017, p. 37).

In summary, by joining the Cittaslow network and entering into co-operation with other member towns, towns expect to achieve a number of benefits, including improved quality of life for their inhabitants, increased attractiveness for tourists, improved image of the town or raising additional funds for investment. In the long term, cities also expect to improve their level of socio-economic development. As C. Honoré (2012), this process is already being observed in many Italian cities, where joining the Cittaslow network has allowed member cities to reduce unemployment and breathe new life into a 'limping' economy.

## Results

A total of 80 people took part in the survey, including 53 women and 27 men. The respondents were first asked whether they were aware that the city they lived in was a member of the Polish National Cittaslow Network. Sixty-seven people (84% of respondents) answered this question in the affirmative, with the remaining people (16% of respondents) answering in the negative. This result means that most of the surveyed inhabitants know about the Cittaslow network and the fact that the town in which they live belongs to the network. This may reflect the effective promotion of the network in the surveyed cities and the respondents' interest in what is happening in the city (cf. Batyk & Woźniak, 2019, p. 60).

Next, people who knew about their city's membership in the Cittaslow network were asked whether they noticed any positive effects of this membership. The respondents' responses are presented in Figure 1.

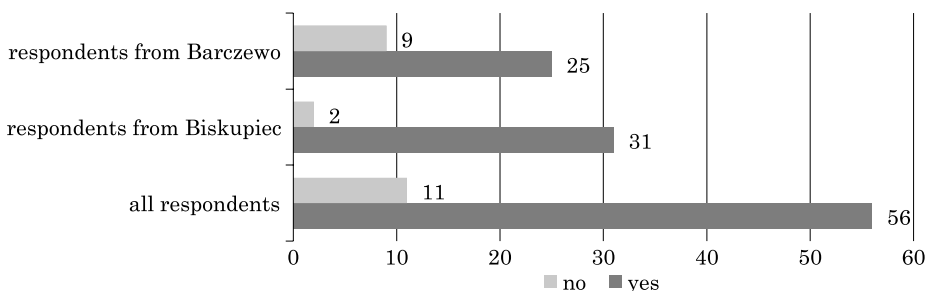


Fig. 1. Noticing the positive effects of membership in the Cittaslow network  
Source: own study based on survey research.

As many as 56 respondents (84% of the total) indicated that they noticed positive effects of cities' membership in the Cittaslow network. This may mean that membership in the network has a real impact on the changes taking place in the city, because residents are already feeling them. A higher percentage of affirmative answers (94%) was recorded in Biskupiec, which may be related to the fact that it has been part of the network longer than Barczewo, so more positive effects had a chance to be revealed there.

Respondents who admitted that they felt benefits from their city's membership in the Cittaslow network were asked to indicate in what areas they noticed these positive effects and what is the degree of their impact. A five-point Likert scale was used to examine residents' opinions in this regard. Respondents were asked to rate their observations on a scale from 0 to 4, where 0 meant no noticeable effects, 1 – a small number of noticeable effects, 2 – an average number of noticeable effects, 3 – a significant number of noticeable effects and 4 – a lot of noticeable effects. The distribution of the answers provided is shown in Figure 2.

According to the respondents, the least positive effects of membership in the network are currently felt in areas such as: improvement of the situation on the labor market and, interestingly, better integration of city residents. The lack or small number of noticeable effects in these areas were indicated by 39% and 41% of respondents, respectively. Only 11% of respondents indicated a very large number of effects observed in the labor market. This is probably due to the fact that such changes are rather long-term and strongly dependent on the economic situation of the country and the region.

The respondents indicated that the most positive effects of the city's membership in the network are visible in the following areas: tourist attractiveness of the city, cultural offer of the city and promotion of the city. In the area of the city's tourist attractiveness, the vast majority of respondents (61%) notice a lot of positive effects, and another 23% notice a significant number of them. In the opinion of city residents, membership in the network also has a significant impact on expanding the city's cultural offer. 50% of respondents indicated a very large number of positive effects in this area, and a significant number of them were indicated by another 34%. Interestingly, not a single person indicated a lack of noticeable effects in this area. Almost half of the surveyed residents (46%) also indicated that there were many positive effects in the area of city promotion. Another 34% of respondents indicated a significant number of them.

Many positive effects were also recorded in the area of spatial development of the city and the development of cooperation with other cities in the network. A very large and significant number of effects were indicated in these areas by 57% and 55% of respondents, respectively. A slightly smaller percentage of respondents – 45% also indicated a very large or significant number of positive effects in the area of development of local entrepreneurship and quality of life in the city, which is crucial from the point of view of the assumptions of the slow city concept.

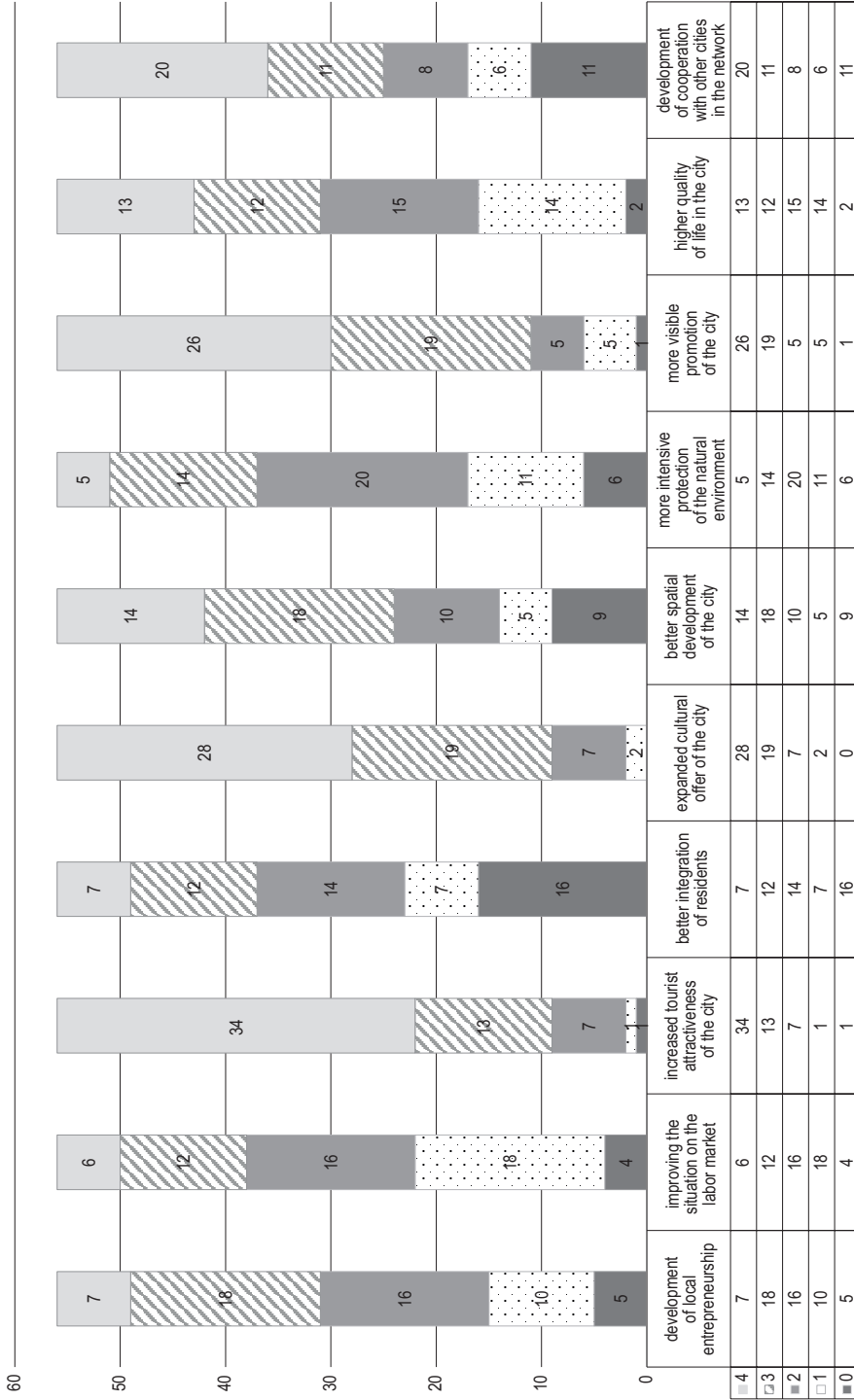


Fig. 2. Benefits from cities' membership in the Polish Cittaslow network, in the opinion of their residents

Source: own study based on survey research.

Next, the respondents were asked whether they noticed and felt any negative effects of their city's membership in the Cittaslow network. Only 4% of respondents answered this question affirmatively, 96% of respondents indicated that they did not notice or feel any negative effects. Respondents who indicated negative effects of the city's membership in the Cittaslow network were asked in which areas these negative effects occur and what is the degree of their impact. The respondents indicated that negative effects occur in areas such as: residents' reluctance to the idea of slow, as it is associated with slowness and backwardness; homogenization of the city, because it loses its uniqueness and becomes similar to other cities in the network; increase in tourist traffic, which becomes burdensome for residents. However, respondents indicated a small number of negative effects in these areas.

Residents of the surveyed cities were also asked to answer two questions: do they support their city's continued membership in the Cittaslow network and will its continued membership in the Cittaslow network result in accelerating the economic growth rate and long-term development of the city? Importantly, as many as 97% of respondents (65 out of 67 people) were in favour of continuing to belong to the network. The structure of the answer to the second question is shown in Figure 3.

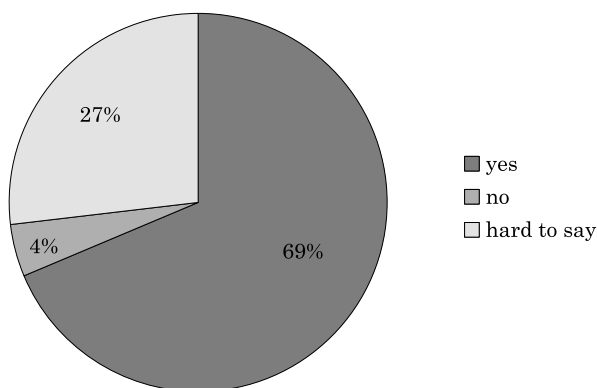


Fig. 3. Do you think that continued membership in the Cittaslow network will accelerate the economic growth rate and long-term development of the city?  
Source: own study based on survey research.

Out of 67 respondents who had knowledge about Cittaslow and their city's membership in the network, as many as 46 people (69% of the total) believe that further membership in the network may accelerate the economic growth rate and long-term development of the city. Eighteen people (27% of respondents) stated that it was difficult for them to say at the moment whether such an effect would occur. Only 3 people answered this question in the negative.

## Summary and Conclusions

Small cities are currently looking for alternative development models that would help them solve the problems they are struggling with and that would enable them to achieve dynamic but sustainable development. One of such models is the slow city model, according to which member cities of the international and Polish Cittaslow network are developing. A city's membership in the network increases its prestige and sets directions for development. In order to be a certified Cittaslow city, a candidate must meet many formal requirements and, in the certification process, fulfil over 50% of the criteria in 7 macro-areas. As a member city of the network, it must, in turn, strive to improve the degree of fulfilment of the above-mentioned criteria, which guides its development.

By adopting the assumptions of the slow city concept and joining the Cittaslow network of cities, member cities hope to achieve various benefits resulting from the membership in the network itself, as well as from the cooperation of cities. They expect to achieve benefits in the cultural, environmental, social and economic spheres. Slow cities hope primarily to improve the quality of life of their inhabitants, but also to improve the situation on the labor market, develop local entrepreneurship, expand the cultural offer and improve spatial development. Membership in the network is to be an opportunity for the sustainable development of the city and is intended to help discover and show its uniqueness and promote the culture of harmonious life without rush. Are these expected effects already felt in cities?

The conducted research shows that the knowledge of the Cittaslow network and the respondents' awareness of their city's membership in this network is quite high (almost 85% of respondents were aware of it). However, it may be surprising that some of the towns' inhabitants did not have such knowledge. This may indicate insufficient promotion of the network and the need for an additional information campaign for city residents. Significantly, 84% of respondents who were aware of their town's membership of the Cittaslow network admitted to noticing positive effects of that membership. Most positive effects were indicated in such areas as: the tourist attractiveness of the town, the cultural offer of the town and the promotion of the town. A lot of positive effects were also reported in the area of town planning and the development of cooperation with other towns in the network. According to those surveyed, the least positive effects from membership of the network have been felt to date in terms of improvements in the labour market and, interestingly, better integration of townspeople. Importantly, only 4% of respondents indicated the existence of some negative effects of Cittaslow network membership. In their opinion, a small number of negative effects can be seen in such areas as: the reluctance of the inhabitants towards the idea of slow, as it is associated with slowing down and backwardness; the homogenisation of the town, as it loses its uniqueness and becomes similar to other towns in the network; the increase in tourist traffic, which becomes burdensome for the

inhabitants. The survey shows that as many as 97% of respondents are in favour of continuing to belong to the network. In addition, almost 70% of respondents believe that continued membership in the network can boost economic growth and the long-term development of the city.

In summary, the respondents' opinions show that in the surveyed towns belonging to the Polish Cittaslow network the most benefits were achieved in the following three areas: increased tourist attractiveness, expanded cultural offer and better promotion of the town. The research hypothesis, which assumed that: "Membership in the Polish National Cittaslow Network brings the most benefits to the cities in the area of promotion" was therefore verified positively. However, the results of the conducted research are not representative for the entire Polish Cittaslow network. Therefore, there is a need to carry out further research which would concern all towns of the network and would be conducted on a representative sample of their inhabitants, and perhaps also of the entrepreneurs located there.

Nevertheless, the presented research results constitute a certain contribution to the discussion on the effects of cities' membership in the Cittaslow network. The results of the research show that membership in the network brings positive effects and is perceived by residents as an opportunity for development and improvement of the quality of life in the city. However, the scale of the effects achieved in a given city depends on many factors, including the involvement of the city authorities and its residents in taking actions consistent with the assumptions of the slow city concept, the possibility of obtaining financial resources for the implementation of this type of activities or the cooperation of cities within the network. The scale of the achieved effects also depends on the specificity of a given city and its endogenous potential.

Translated by Authors

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## STUDENTS' PREFERENCES REGARDING SCIENTIFIC CLUBS AT THE FACULTY OF ECONOMIC SCIENCES OF THE UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

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### Abstract

The purpose of the research was to comprehensively discuss the areas of scientific interest of students in the various majors at the Faculty of Economic Sciences at UWM in Olsztyn and to identify what activities they find most useful. The research was conducted by a diagnostic survey method using a questionnaire sheet. The survey shows that the scientific clubs at the Faculty of Economic Sciences correspond to the interests of students. Moreover, students indicated that the benefits and activities offered by the clubs are attractive and in line with their expectations. The activities provided by these organizations enable them to develop and achieve the goals they set while participating in the study clubs. The results of the study may contribute to the preparation of a better offer of scientific clubs at the Faculty of Economic Sciences at UWM in Olsztyn so that it is attractive and meets the needs of students of different majors as well as possible.

**PREFERENCJE STUDENTÓW DOTYCZĄCE KÓŁ NAUKOWYCH  
NA WYDZIALE NAUK EKONOMICZNYCH  
UNIwersYTETU WARMIŃSKO-MAZURSKIEGO W OLSZTYNIE**

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Kody JEL: A22, I23, J24.

Słowa kluczowe: koła naukowe, studenci, zainteresowania, preferencje.

**Abstrakt**

Celem badań było kompleksowe omówienie obszarów naukowych zainteresowań studentów poszczególnych kierunków na Wydziale Nauk Ekonomicznych UWM w Olsztynie oraz identyfikacja, jakie aktywności uważają za najbardziej przydatne. Badania przeprowadzono metodą sondażu diagnostycznego z wykorzystaniem arkusza ankiety. Z przeprowadzonego badania wynika, że koła naukowe na Wydziale Nauk Ekonomicznych odpowiadają zainteresowaniom studentów. Co więcej, studenci wskazali, że korzyści oraz aktywności oferowane przez koła są atrakcyjne i zgodne z ich oczekiwaniami. Działalność prowadzona przez te organizacje umożliwia im rozwój oraz realizację celów, które wyznaczyli sobie podczas uczestnictwa w kołach naukowych. Wyniki badań mogą przyczynić się do przygotowania lepszej oferty kół naukowych na Wydziale Nauk Ekonomicznych UWM w Olsztynie, tak aby była atrakcyjna i możliwie jak najlepiej odpowiadała potrzebom studentów różnych kierunków.

## **Introduction**

Scientific clubs at universities are a well-known and common form of developing students' scientific interests and skills. According to Gancarz (2013, p. 153, 154), they are "a place for developing interests, expanding knowledge, self-education, and acquiring many valuable skills". Participation in a study club makes it possible to supplement the knowledge gained in classes, as well as to expand it with additional elements that are not realized during didactic classes. It should be mentioned that the degree of expansion of one's educational horizons largely depends on the involvement and active participation in the activities of the club of the student himself (Bęczkowska, 2019, p. 2). At the Faculty of Economic Sciences of the University of Warmia and Mazury in Olsztyn, there are a total of more than 2,200 students in three majors: economics, management and production engineering and management. In all majors in full-time and part-time mode. In the majors of economics and

management, education is carried out in the first and second degrees in the management and production engineering major only in the first degree, but these are dual degree programs combining the knowledge gained at university with practical preparation for the profession. During the period under review for 2018-2023, 11 study clubs were active. Some of them persisted for many years others closed or were created. Interest in individual clubs varied greatly from a few to more than 30 people. Given these observations, one should ask whether the interest of students in the problems dealt with by individual study clubs depends on the field of study and year of study?

The aim of the research was to comprehensively discuss the areas of scientific interest of students in the various majors at the Faculty of Economic Sciences at UWM in Olsztyn, and to identify what activities they find most useful.

## Literature Review

The origins of study clubs can be traced as far back as the 12<sup>th</sup> century, that is, with the establishment of the first universities. Students have the right to associate in university student organizations, in particular in scientific clubs and artistic and sports according with the Ustawa z dnia 20 lipca 2018 r. Prawo o szkolnictwie wyższym i nauce (t.j. Dz.U. z 2023 r., poz. 742). The active involvement of students in the activities of scientific clubs drives these organizations into action. Academic teachers impart knowledge to students and enable them to develop or explore their interests (Kurcz, 2005). According to Śnieżek (2017, p. 10), responsible universities are those that are open to various initiatives, expanding the scope of their operations and establishing cooperation with other organizations.

Scientific clubs, like any organization, have their own tasks. These tasks can be divided into three groups:

- scientific tasks – these include: broadening the didactic process within the framework of the implemented educational programs, enabling the publication of the results of their work in reputable scientific journals, enabling participation in conferences, sessions, scientific seminars, enabling them to broaden their interests;

- tasks shaping the silhouette of a graduate – these include building the ability to use knowledge creatively, deepening the ability to present one's own views and defend them; teaching the appropriate display of one's skills, preparing one's subject matter for an informed choice of further education;

- social tasks – these include motivating further development, demonstrating charitable activities, building skills for creative use of knowledge, integration-cultural activities.

Polish universities have many scientific clubs with similar areas of interest, which may differ in their goals of operation. The MarkeTEAM study club at the University of Lodz focuses on marketing. Thanks to participation in this club, students have a chance not only to gain knowledge and practical skills, but also to complete student internships that make it easier to get a job (Kurzyk, 2015, p. 130). At the University of Gdansk, the scientific club “Auditor” is active in the field of accounting in the broadest sense. Students, participating in the club, not only take part in and organize scientific seminars, but also develop management games that simulate the actions of an enterprise during decision-making (Matczuk, 2007, p. 116-118).

Scientific clubs at universities allow students to deepen their passions and knowledge, and their additional advantage was the opportunity for their members to gain experience. This experience was gained through various activities, such as conducting scientific research, publishing publications, participating in scientific conferences or organizing training courses and meetings. Project activities teach how to find business partners, sources of funding and time management, which is an essential part of thriving in the market. The success of a study club consists of two complementary elements: a motivating supervisor and a group of committed students. The tutor of the study club plays a key role in the entire process of its operation. He is the one who influences the direction and pace of the group’s development, and his actions and personality have a huge impact on the work of the students. Proper care positively influences their activities, while improper care can negate student initiative (Śnieżek, 2017, p. 12-15).

However, there is currently little interest in study clubs at universities. Those who choose to be so active usually plan to continue their education or apply for an academic scholarship, and involvement in a study club helps to obtain it (Czapiewska, 2021, p. 114, 115). Nowadays, studying alone is not enough to achieve success, so students often need to show additional activities, and get the expected results. One such activity is activity in the Study Club. Motivations for enrolling in study clubs are individual for each student. Research on student activity in study clubs is much needed. Their value stems from the highly competitive labor market, where potential candidates do not always show the activity expected by employers (Łubek, 2021, p. 176-178).

According to Kurczyk (2015, p. 131), in order for the developmental goals of the members of the club to be realized, its activities must be properly organized. The issue of student activity in scientific clubs was addressed by students of the Scientific Club “Maestros de la economia” operating at the Faculty of Economics and Management of Opole University of Technology. The research showed that students in scientific clubs develop their skills and competencies, although only about 50% of those surveyed partially agreed that they had acquired new knowledge about creating scientific publications. The conclusion of the research was that scientific clubs should be tailored to students’ interests, offering different and interesting conditions for participation (Boichuk, 2018, p. 6-8).

Study clubs in other countries have similar, though slightly different, goals compared to those in Poland. In some, as in Poland, they focus on deepening and broadening students' skills, while in others they follow a slightly different program, for example, leading to student involvement in association. Participation in a study club for American students means interest and involvement in the university community. Inactivity has no measurable benefits either on an individual or social level (Feeney, 2018). Participation in a study club allows you to become part of a community in which the exchange of knowledge and experience with people with similar scientific interests is a fundamental element of development (Barnes *et al.*, 2021). An example of a scientific club (scientific association) abroad is the Harvard Undergraduate Research Association (HCURA), operating at Harvard University in the United States. This club was founded in 2007, and its mission is to build an interdisciplinary research community that engages in projects that enrich the undergraduate research experience. HCURA's goal is to connect and expand the undergraduate research community on a daily basis, implemented through a variety of activities such as conferences, mentoring and publications.

The Harvard Undergraduate Research Association was founded in response to the "Research Experience at Harvard University" report, which found that for many students, research was one of the most rewarding experiences at Harvard. Today, HCURA runs a number of initiatives on the university campus to support students' involvement in research and enable them to share their work. These initiatives include a peer advising program that connects experienced senior students with first-year students interested in pursuing similar research, the *Visit* research symposium, which provides visitors with insights into research conducted by Harvard students, and the Life Sciences Undergraduate Research Symposium, jointly sponsored by the Office of Undergraduate Research and Scholarship, which gives students access to a number of laboratories where they can begin research in the life sciences.

The Harvard Undergraduate Research Association also has an annual tradition of holding a three-day National Collegiate Research Conference, which is the largest student-run conference. Every January, the conference brings together undergraduate researchers from across the country at Harvard. The conference provides young researchers with a chance to present their research and network with large companies and research institutions, research leaders, entrepreneurs and other attendees. In the past, NCRC has featured such esteemed speakers as Jeffrey Sachs, Stephen Wolfram, Robert Gallo, Melissa Franklin, Douglas Melton, Walter Lewin, Steven Pinker and many others. During the conference, a series of workshops and group activities take place, prompting participants to reflect on their future and the future of research.

Generally, in Poland, participation in a study club does not involve paying a membership fee. In other countries, students who belong to study clubs often have to pay such dues. Examples of associations include: The Alliance to Catalyze Change for Equity in STEM Success, the American Society for Biochemistry and

Molecular Biology and the American Society for Pharmacology and Experimental Therapeutics. At ACCESS, annual membership fees for undergraduate students range from \$10 to \$30. Both ASBMB and ASPET charge the lowest dues, at \$10 per year for undergraduate students. However, it is worth mentioning that the societies offering the most undergraduate programs and the cheapest membership fees do not always have the highest membership levels in this group. This means that there are other factors that influence the decision to join an association. Additional benefits can play a key role in the membership decision (Primus *et al.*, 2022).

In order to understand who among the young researchers (Early Career Researchers, EKR) are active in leadership roles in research clubs, a survey of 20 societies from the UK and US was conducted. Using the Future of Research network on Twitter and a mailing list, information was collected from the community on this topic. Based on the data obtained, it was concluded that less than 2% of the leadership positions in these societies are held by early career researchers (EKRs). These positions are held mainly by postdocs, but also by PhD students and part-time assistant professors. The involvement of EKRs in leadership benefits both the scientific societies and the researchers themselves. Early Career Researchers gain professional experience, build independence and contribute to setting the direction of their research communities. These positions often lead to the recruitment of EKR leaders for other roles in the community or in other organizations (Bankston *et al.*, 2020).

## Methodology of Own Research

The research was conducted by a diagnostic survey method using a questionnaire sheet. The respondents were students of the Faculty of Economic Sciences at UWM in Olsztyn divided into three factions depending on the field of study: economics, management and production engineering, management. Students were asked to participate in the research, regardless of whether they were affiliated with scientific clubs or not. After obtaining the return of completed questionnaires, it was found that only students majoring in economics constituted a representative sample of the fractions. A total of 146 students participated in the survey, including 120 from the economics major, 21 from the management major and five from the management and production engineering major. The minimum sample for this fraction was 41, for students in management and production engineering was 7, and for management faculty was 35.

The sample size was calculated according to the formula (Jabłońska & Sobieraj, 2013, p. 35):

$$N_{\min} = \frac{Np (\alpha^2 \cdot f(1 - f))}{e}$$



where:

- $N_{\min}$  – minimum sample size,
- $Np$  – the size of the population from which the sample was taken,
- $a$  – confidence level for the results, the value of the  $Z$  in the normal distribution for the assumed level of significance – assumed 1.96,
- $f$  – fraction size,
- $e$  – assumed maximum error, expressed as a fractional number – assumed 5% (0.05).

The survey was conducted through the use of the Internet using the snowball method. The sample was constituted of students of University of Warmia and Mazury studying on Economic Sciences Faculty. It was a non-random sampling in that an initially selected small group of respondents is surveyed and each member of this group identifies (recommends) other individuals belonging to the general population to be further surveyed. The basis for the choice of the survey method was the possibility of reaching a wide range of students of the Faculty of Economic Sciences.

The survey questionnaire used for the study contained 14 questions, with 6 questions providing the opportunity to indicate more than one answer, 2 questions allowing one of two answers, and 6 questions requiring only one answer from among the possible answers given.

The study used the chi-square test of concordance, which was used to assess whether there was a statistically significant relationship between two qualitative variables. Which allowed us to answer the question of whether there is a relationship between majors and years of study and students' interests related to the activities of scientific clubs. Chi-square was calculated according to the formula:

$$\chi^2 = \sum_{i=1}^i \sum_{j=1}^j \frac{(A_{ij} - E_{ij})^2}{E_{ij}},$$

where:

- $i$  – number of lines,
- $j$  – number of columns,
- $A_{ij}$  – the actual frequency in the  $i$ -th row of the  $j$ -th column,
- $E_{ij}$  – the predicted frequency in the  $i$ -th row of the  $j$ -th column.

### **Characteristics of Scientific Clubs Operating at the Faculty of Economic Sciences UWM in Olsztyn**

Over the 5 years under study (2018-2023), 11 scientific clubs were active at the Faculty of Economics of the University of Warmia and Mazury in Olsztyn: International Economics, Sports Finance and Management, Investors, Accounting,

Auditor, Human Resource Management "Creative", Scientific Club Coaching "Best Pass", Insurance "Benefit", Marketing, Student Forum Business Centre Club, Economic Liberalism.

The study club "International Economics" functions at the Department of Economic Policy. It was established in January 2005 and has been active until now. It mainly works in the areas of international trade, international finance and international economic relations. Its activities include organizing meetings and seminars with the participation of UWM Olsztyn academics, politicians and representatives of other scientific clubs; expanding cooperation with other scientific clubs and organizations operating at the University as well as outside it; developing research with the cooperation of the Department's staff.

The "Sports Finance and Management" research club was active from 2015-2019 at the Department of Finance and Banking. The club dealt with topics related to sports financing. The main goal of the club was to popularize issues related to management, sponsorship and marketing in sports and to analyze the effectiveness of its financing. The Club's activities focused, among other things, on the organization of scientific conferences; preparation of seminars and meetings with well-known sports activists; cooperation with other Scientific Clubs and organizations related to sports activities; conducting scientific research.

The "Investors" study club has been operating since 2008 under the auspices of the Department of Finance and Banking. The aim of the club is the practical application of knowledge and the acquisition of skills for effective money management. Students in the club can take advantage of, among other things, the opportunity to participate in conferences and training courses; to acquire practical skills related to investing.

The scientific club "Accounting" was included in the List of Scientific Clubs of UWM in 2008. It has been operating so far at the Department of Accounting. It deals with accounting in its broadest sense.

The "Auditor" study club functioned from 2015-2019 at the Department of Accounting. The main areas of meetings were financial auditing and internal and external auditing. The scientific goal of the club was to deepen knowledge in the broad field of auditing and to learn the secrets of the work of an auditor.

Scientific Club "Human Resource Management Creative" was established in 2009 at the Department of Management Organization. The club has been carrying out its activities until now, and through participation students can gain practical knowledge and experience in the field of Human Resources Management. The club's activities include organizing discussion panels, holding training courses and research and development activities.

The "Coaching's Best Pass" scientific club was active in 2016-2018 at the Department of Spatial and Environmental Economics. It focused its activities on the interest in coaching and personal development, which students could develop through participation in panel discussions and scientific seminars.

The scientific club “Marketing” was established in 2005 and was active until 2018. The purpose of the club was to expand students’ knowledge of marketing and managerial skills. Students, thanks to their participation in the club, conducted scientific research work, organized conferences, training courses and workshops.

The Scientific Club “Student Forum Business Centre Club” was actively active in 2019, suspended its activities in 2020, after which it resumed in 2021 and remains active to the present time at the Department of Finance. The club distinguishes itself through practical activities, which often take place outside the walls of the university. These activities provide opportunities to acquire skills and competencies that increase the value of students in the labor market.

The study club “Economic Liberalism” has been active since 2023 at the Department of Economic Theory. Table 1 shows the changes that occurred in the number of members of each scientific club in 2018-2021.

Table 1

Number of members of scientific clubs in years 2018-2023

Scientific club name	2018	2019	2020	2021	2022	2023
SC International Economics	10	4	10	5	6	9
SC Finance and Management in Sports	13	6	-	-	-	-
Investors' SC	10	10	6	9	13	15
SC Accounting	10	5	9	7	23	15
SC Auditor	9	7	-	-	-	-
SC Human Resource Management “Creative”	10	19	39	29	38	18
Scientific Club of Coaching “Best Pass”	11	-	-	-	-	-
Insurance SC “Benefit”	10	-	-	-	-	-
SC Marketing	8	-	-	-	-	-
SC Student Forum Business Centre Club	-	13	-	15	12	9
SC of Economic Liberalism	-	-	-	-	-	7

Source: compiled on the basis of data from the Faculty of Economics at UWM in Olsztyn.

During the 5 years of scientific clubs at the Faculty of Economic Sciences, 373 students actively participated in them. In 2022, 92 students, which is about 27% of the total students of the Faculty of Economic Sciences. Index of dynamics of changes regarding number of students in science clubs in years 2018-2023 is equal to 80.22%. Examined index indicates decrease of value of the examined phenomenon in the examined period in comparison to base, basic period. It was calculated according to the general formula for the index of dynamics of changes:

$$\frac{y_t}{y_0} \cdot 100,$$

$y_t$  – value of the examined phenomenon in the examined period,

$y_0$  – value of a phenomenon in base, basic period.

We can note that as many as 5 clubs ended their activities after 2018. The most common reason was a lack of volunteers. Another factor that could have influenced on the closure of study clubs could have been the COVID-19 pandemic. For clubs that based their activities on face-to-face contacts, the pandemic made communication between participants much more difficult. The lack of opportunities for live meetings may have resulted in a decrease in member motivation and commitment, which ultimately led to the termination of some clubs. However, more detailed research would be needed to determine exactly what impact the pandemic had on the termination of activities. On the other hand, the SC Student Forum Business Centre Club halted it in 2020 but resumed this activity a year later.

## Students' Interests and the Offer of Scientific Clubs at the Faculty of Economic Sciences at UWM in Olsztyn

The largest group of respondents were economics students, especially from the second year, while management students in similar numbers represented each year. The smallest group was made up of management and production engineering students (Fig. 1).

Analyzing the data, it is possible to see a diversity of responses in the different years of students who participated in the study in each field of study. In all majors, the most willing participants in the study were, second-year students. In the management major, 38% of the respondents were second-year students, 33% were

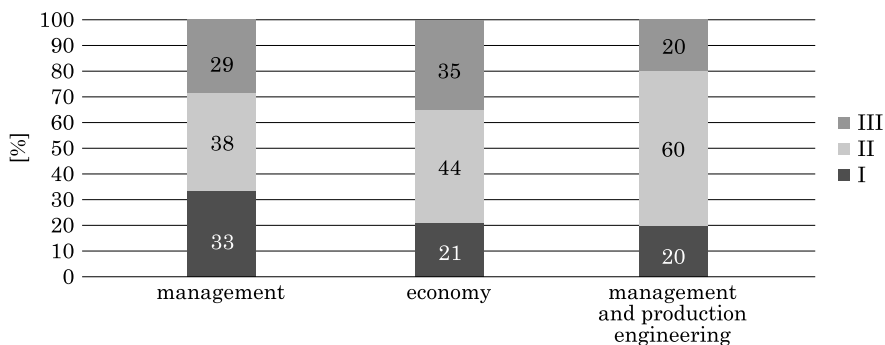


Fig. 1. Participation of respondents of each year of students by year of study  
Source: own compilation based on research.

third-year students, and 29% were first-year students. For the economics major, almost half of the respondents, 44%, were in their second year, while 35% were in their third year and 21% were in their first year. In the field of production management and engineering, 60% of respondents were second-year students, while both first and third years accounted for 20% of respondents each.

The interests of students in the Faculty of Economic Sciences differ from one faculty to another. In particular, different preferences from the others were evident in the management and production engineering major. The survey indicated that economics students focused their interests most on macroeconomics and finance, indicating a tendency to understand and study economic systems and financial markets on a macro scale. In the management students indicated human resource management and management, which shows that students see their future as managers and want to acquire knowledge on how to effectively manage teams and organizations. In the production management and engineering major, interests were mainly distributed between logistics and investment. These preferences indicate that students are oriented toward careers in the manufacturing and logistics sector, where they will be able to use their skills in, for example, supply chain management or investment projects (Fig. 2).

Students were also asked about the goals they want to achieve through participation in study clubs. Students could indicate more than 1 answer. These interests depended on the direction of the stages (Fig. 3).

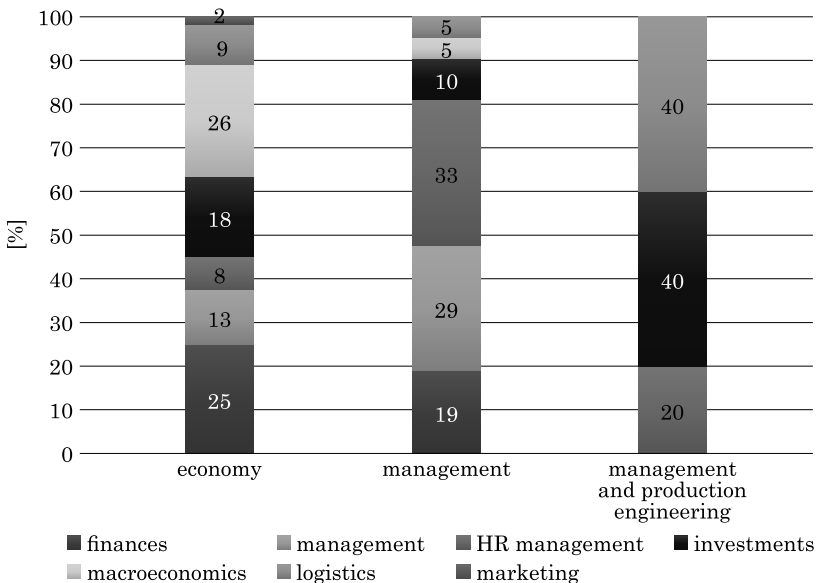


Fig. 2. Interests of students of the Faculty of Economic Sciences

Source: own compilation based on research.

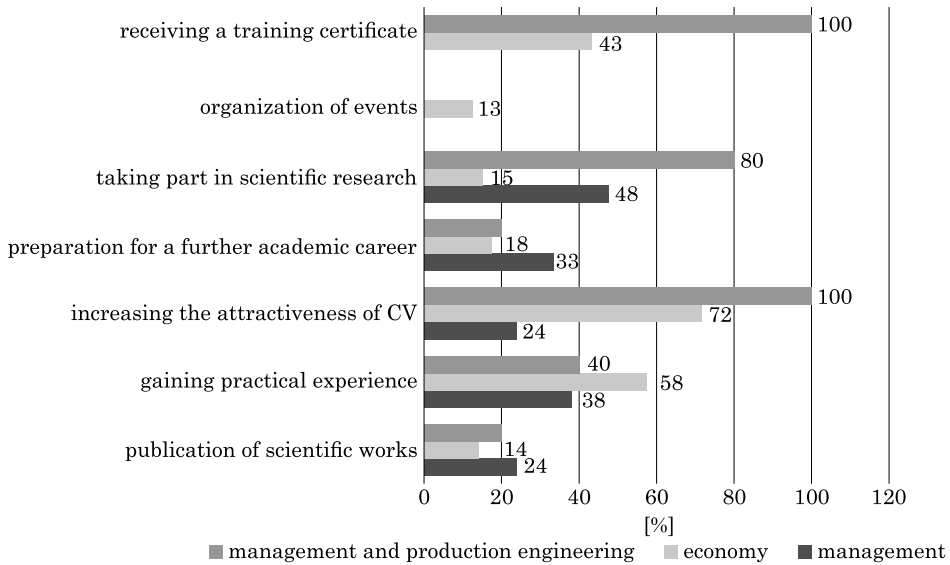


Fig. 3. Students' goals to be achieved while participating in study clubs

Source: own elaboration based on survey questionnaire.

For economics majors, the most important goal to achieve while participating in a study club was to make their resume more attractive (72% of indications). The second most popular goal among students in this major was to gain experience (58%), followed by the goal of receiving a certificate (43%). Other goals for this direction were less popular among students, with results ranging from 13-18%. These results show that for students in this direction, an integral part of belonging to study clubs is to increase attractiveness, which is associated with distinction in the job market and assistance in future business life. This goal may be related to the fact that currently a large percentage of employers pay attention to the attractiveness of candidates in terms of their courses, training or experience in a given position. The next most popular goals were also related to students' future working lives. If we analyze how the students of each year answered, it is clear that there were differences in the answers. For first-year students, the most important goal was gaining experience (58%), the second most frequently marked answer was to receive a certificate from a training course (42%), and the third was to make their resume more attractive (33%). The other goals were not very popular, with results ranging from 6-12% (Fig. 4).

For second-year students, the most popular chosen goal was to make their resume more attractive (56%), followed by gaining experience (42%), and the third was to receive a training certificate. The other goals were less popular among students in that year, with results ranging from 9-25%. The last group of individuals surveyed, were third-year students. The most popular goal

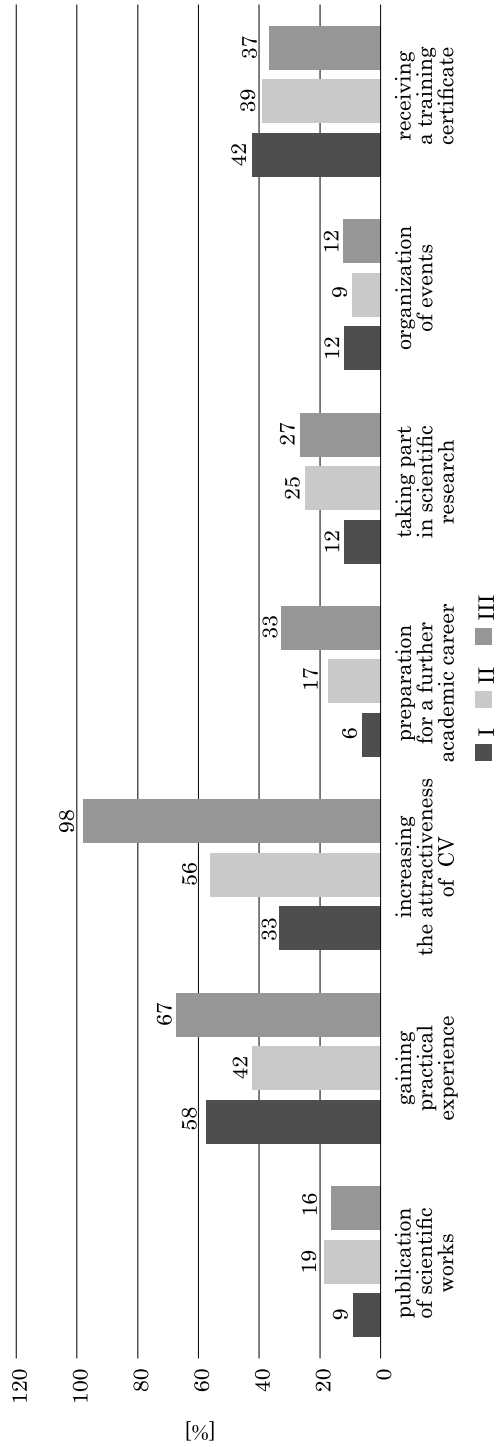


Fig. 4. Students' goals to be achieved while participating in study clubs  
Source: own elaboration based on survey questionnaire.

to achieve while participating in a study club for this group was to increase the attractiveness of the resume (98%), the second most popular goal among students was to gain experience (67%), and the third most popular goal was to receive a certificate from training (37%). Other goals were less popular among this group of students, with results ranging from 12-33%. With the responses obtained, it should be added that students could indicate more than 1 answer.

Figure 5 shows the preference for activity in study clubs for the three majors. Here, too, students could indicate more than one answer. For the economics major, the preferred activities were training, which was indicated by 83%, research projects – 48%, conferences – 29% and lectures – 13%.

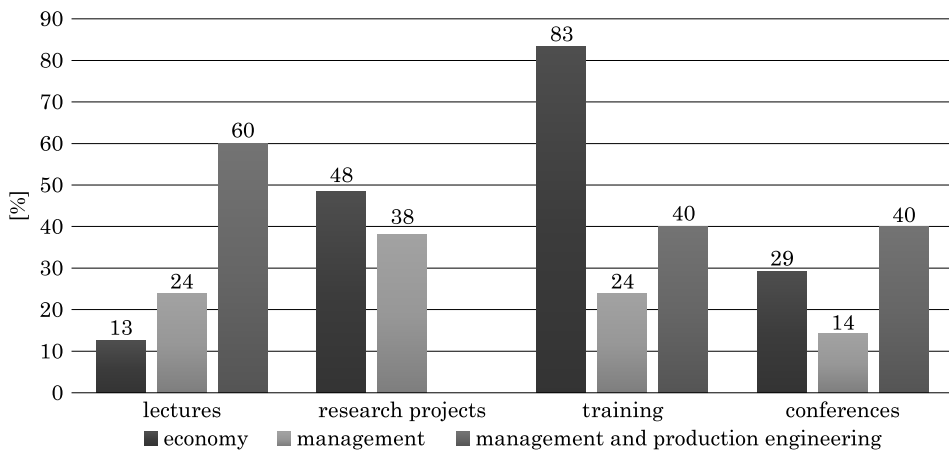


Fig. 5. Preferred activities by students in study clubs

Source: own elaboration based on survey questionnaire.

This shows that economics students most often chose training as their preferred activity, indicating a strong interest in acquiring practical skills and knowledge. For management majors, the preferred activities were research projects, which reached 38%, training – 24%, lectures – 24% and conferences – 14%. For management, none of the activities stood out significantly in terms of popularity. For the management and production engineering major, the preferred activities were lectures, which marked 60%, training – 40% and conferences – 40%. Students in this field show moderate interest in lectures, training and conferences. The results indicate that for students of the faculty of economics, regardless of the major they attend, active participation in study clubs was a very important aspect. These activities allow for personal as well as scientific development, which greatly influences the satisfaction and expansion of students' knowledge.

Figure 6 shows the students' preference for activities in study clubs, broken down by the year of the students participating in the survey. It is worth noting



that these were multiple-choice responses, meaning that students could mark more than one preferred activity. For first-year students, the most preferred activity in study clubs was training and lectures, indicating a concentration on acquiring the basic foundations of knowledge.

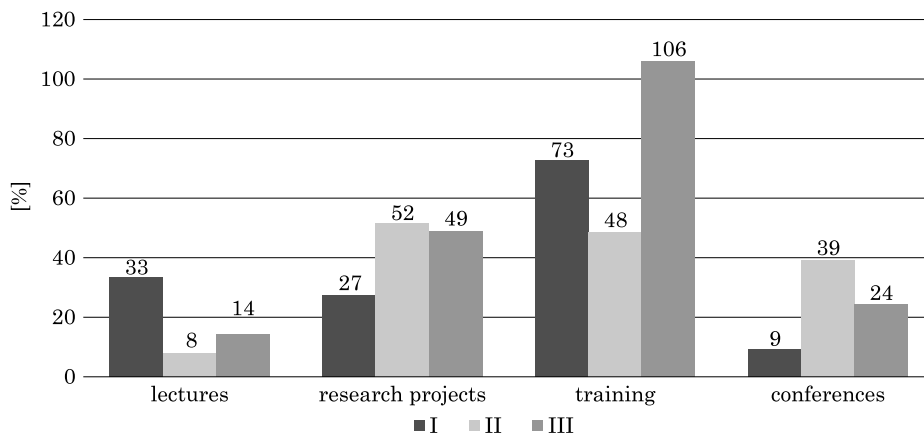


Fig. 6. Preferred activities by students in study clubs

Source: own elaboration based on survey questionnaire.

It can be seen that as students gained experience, they shifted their interests towards research projects and conferences. This indicates that students already feel more comfortable with their knowledge and want to present the results of their work. The most important thing for third-year students was training that will help them gain experience related to the job market.

It was found that there is a statistical relationship between majors and vintages and interests, goals of study clubs at  $\alpha = 0.05$  level. The results of applied compatibility test showed that the students' interest (Fig. 2) are depended on field of study of surveyed units, what is confirmed by the fact, that value of Chi-square was equal to 3.125 and was greater than value of Chi-square in its distribution charts. Goals of the students intended to realise during participation in sciences clubs (Fig. 3) are depended on field of study of surveyed units, what is confirmed by the fact, that value of Chi-square was equal to 2.285 and was greater than value of Chi-square in its distribution charts. Goals of the students intended to realise during participation in sciences clubs (Fig. 4) are depended on year of study of surveyed units, what is confirmed by the fact, that value of Chi-square was equal to 2.285 and was greater than value of Chi-square in its distribution charts. Preferred activities of students in science clubs (Fig. 5) are not depended on field of study of surveyed units, what is confirmed by the fact, that value of Chi-square was equal to 0.25 and was lesser than value of Chi-square in its distribution charts. Preferred activities of students in science clubs (Fig. 6) are not depended on year of study of surveyed

units, what is confirmed by the fact, that value of Chi-square was equal to 0.25 and was lesser than value of Chi-square in its distribution charts. There is a statistical relationship between vintages of study and preferred activities. In contrast, there was no statistical relationship only between majors and students' preferred activities in study clubs.

## Summary

The aim of the research was to comprehensively discuss the areas of scientific interest of students in each course at the Faculty of Economic Sciences at UWM in Olsztyn, and to identify what activities they find most useful.

Analysis of the survey results shows us the diversity in areas of interest among different majors, as well as yearbooks. The proposed areas of activity of the scientific clubs largely coincide with the interests of the various majors, which has a positive impact on the personal development of students. The activities proposed by the scientific clubs coincide with the activities expected by the students. Moreover, they allow students to achieve the goals they have set for themselves.

Taking into account the research question posed in the introduction whether the interest of students in the problems dealt with by the various scientific clubs depends on the field of study and yearbook, the answer should be in the affirmative. It should be added at this point that the research sample was representative only of the economics major. This result was a result of the poor involvement of students in actions regarding diagnostic surveys. This was one of the problems encountered during the research. Nonetheless, it was worth looking at the results obtained because when examining the statistical relationship, it was not found only between majors and students' preferred activities in study clubs, alpha level = 0.05.

The results indicate that those studying management and production engineering were more interested in the practical side, especially logistics and investment. Economics and management majors indicated more diverse interests and often in line with the major they were studying. On the other hand, analyzing the responses of each year group about the goals of their activities in the clubs, it can be seen that the older the year group, the more often they think about their resume. Similarly, it can be indicated that with successive vintages, the interests in activities were related to gaining experience that could be used in a resume and, consequently, improve one's situation on the job market. The results of the study may contribute to the preparation of a better offer of scientific clubs at the Faculty of Economic Sciences at UWM in Olsztyn so that it is attractive and meets the needs of students of different majors as well as possible.

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## ASSESSMENT OF INCOME DIFFERENTIATION OF DIFFERENT-SIZED HOUSEHOLDS IN POLAND

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JEL Classification: D10, G50.

Key words: household income, differentiation, size of households.

### Abstract

The household is the basic economic unit that participates in both economic and social life. It must generate income, the level of which may change over time and vary depending on the size of the household. The aim of the research was to assess the scale of differentiation of household income in Poland in the years 2014-2021 due to their size. The study used the comparative analysis method. Secondary data on disposable income per person in the household was compared. The variation in income in particular years was examined using the classic coefficient of variation. In the years under study, in each type of household (taking into account its size), disposable income increased, with a higher growth rate recorded by larger households. In all years, the size of the farm significantly differentiated the level of disposable income of households, and this differentiation showed a decreasing trend.

### OCENA ZRÓŻNICOWANIA DOCHODÓW GOSPODARSTW DOMOWYCH RÓŻNEJ WIELKOŚCI W POLSCE

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Kody JEL: D10, G50.

Słowa kluczowe: dochody gospodarstw domowych, zróżnicowanie, wielkość gospodarstw domowych.

## Abstrakt

Gospodarstwo domowe jest podstawową jednostką ekonomiczną, która bierze udział zarówno w życiu gospodarczym, jak i społecznym. Musi ono pozyskiwać dochody, których poziom może się jednak zmieniać w czasie i być zróżnicowany w zależności od wielkości gospodarstwa domowego. Celem badań stała się więc ocena skali zróżnicowania dochodów gospodarstw domowych w Polsce w latach 2014-2021 z uwzględnieniem wielkości gospodarstwa domowego. W badaniu wykorzystano metodę analizy porównawczej. Porównano dane wtórne dotyczące dochodów rozporządzalnych na jedną osobę w gospodarstwie domowym. Zróżnicowanie dochodów w poszczególnych latach zbadano z wykorzystaniem klasycznego współczynnika zmienności. W badanych latach w każdym typie gospodarstwa domowego (biorąc pod uwagę jego wielkość) dochody rozporządzalne rosły, przy czym wyższe tempo wzrostu odnotowały gospodarstwa większe. We wszystkich latach wielkość gospodarstwa istotnie różnicowała poziom dochodów rozporządzalnych gospodarstw domowych, przy czym zróżnicowanie to wykazywało tendencję malejącą.

## Introduction

A household is an economic unit that participates in social and economic life. It is most often a family that collects and spends income together. In order to meet their needs, households demand various types of goods and services. In order to meet their expenses, households must therefore obtain income.

Household income is income, usually cash, earned over a given period of time. It can come from various sources, depending on who receives it and for what reason. Most often, it comes from an employment relationship, but it can also be income from capital and from social benefits, e.g. benefits, pensions, retirement pensions or benefits from the “Family 800+” program. The level of income earned may change over time and may also vary regionally or depending on the type of household, including its size measured by the number of its members.

In light of the above, the aim of the research was to assess the scale of differentiation of household income in Poland in the years 2014-2021 due to their size. The basis for this assessment was the analysis of changes that occurred in the level of income of households of different sizes in the years 2014-2021. The following research question was asked in the work: *Has the differentiation of household incomes, taking into account the criterion of their size, increased or decreased in the years 2014-2021?*

The following research methods were used in the study: literature analysis and comparative analysis of secondary data on disposable income per person in a household. This data was obtained from the Knowledge Databases of the Central Statistical Office. They were compared vertically – by year and horizontally – by household size. An indicator analysis was also conducted, using a constant-based dynamics indicator, assuming 2014 as the base year. This indicator was calculated according to the following formula (Wysocka-Fijorek & Lachowicz, 2018, p. 14):

$$I_{t0, t} = \frac{x_t}{x_{t0}} \quad (1)$$

where:

$x_t$  – value in the period under review,

$x_{t0}$  – value in the period used as the basis for the research.

The variation of disposable income in individual years was examined using the coefficient of variation. It allows for the comparison of the variation of the same feature in different groups, or several features expressed in appropriate terms. The coefficient of variation is the quotient of the absolute measure of variation and the average level of the feature value and is expressed by the formula (Central Statistical Office, 2023):

$$V_s = \frac{S}{\bar{x}} \cdot 100 \quad (2)$$

where:

$S$  – standard deviation,

$\bar{x}$  – arithmetic mean.

High numerical values of the coefficient of variation indicate the heterogeneity of the statistical population being studied. It is conventionally assumed that if the coefficient of variation does not exceed 10%, the features show little differentiation (compare: Wierzbicka, 2021, p. 213; Wierzbicka *et al.*, 2021, p. 89).

## Literature Review

Earning income by households is a necessary condition for them to function properly, achieve their goals and fulfil specific functions. Earning income is the basis for ensuring financial security for household members. “The level of income earned indicates the level of wealth of a given society, but above all it affects the size and structure of consumption and the interest of entities in using financial services” (Mazurek-Krasodomska, 2017, p. 189). “Income has a fundamental impact on the financial situation of a household, it enables meeting the needs of its members and determines the limit of expenditure” (Rudnicki, 2018, p. 89). In economic terms, income is a means to achieve the goals of the household, affects its development possibilities and is one of the basic factors determining cultural and social changes. The income of individuals is therefore not only an economic category, but also a social one, as it is a determinant of the household status (Kata, 2020, p. 27). Therefore, proper planning and management of the household budget becomes extremely important (Samsel, 2019, p. 66).

Income is a basic factor determining the level of satisfaction of needs, and also affects the sense of stability of household members and broadly understood

security. Households obtain income from various sources. Economic theory lists the following basic sources of household income: remuneration (income from work), land rent and lease payments (income from land), dividends and interest (income from capital) (Wałęga, 2012, p. 219, 220). In more detail, the following sources of household income can be indicated (Jabkowski & Piekut, 2022, p. 182):

- salary,
- income from self-employment,
- income from agricultural work,
- annuities,
- retirement pensions,
- unemployment benefits and other social benefits and allowances,
- income from investments, savings, insurance, property,
- other.

Household income can also include various types of financial benefits of a social, family-friendly or educational nature. An example is the “Family 800+” program, the aim of which is to help raise children and reverse the negative demographic trend in Poland. Financial resources from this program increase household budgets and change the structure of their expenditures (Wiśniewska, 2017, p. 116, 117). “Social assistance benefits are a supplementary benefit granted on the basis of household income taking into account all other taxed and untaxed income of the person and family. Their purpose is to supplement household income in a situation where other incomes in total, including income from other social benefits, are lower than the income criterion for social assistance” (Starega-Piasek & Wóycicka, 2009, p. 2). Studies show that on average, families need an income of about twice the poverty line to meet their most basic needs (Jiang *et al.*, 2017, p. 2). Importantly, in order to properly manage their finances, households should focus both on current income generation and on the possibilities of increasing, allocating and diversifying it (Rudnicki, 2018, p. 89, 90).

Household income, regardless of its source, is determined by many factors. The most frequently mentioned are socio-demographic factors, such as: occupation, education and age of household members (Grzywińska-Rapca & Kobylińska, 2019, p. 47). The differentiation of the material wealth of households also depends on the type and size of the household, geographical location and class of place of residence (Dziechciarz-Duda, 2018, p. 38; Jędrzejczak & Pakasiewicz, 2018, p. 150). The following factors determining the level and structure of household income and inequalities within their area are most often mentioned in the literature (Mazurek-Krasodomska, 2017, p. 190):

- level and field of education of household members,
- economic activity of household members,
- main source of income for family members,
- size of household,
- place of residence,
- tax burden and other income of household.



One of the important factors determining the differences in household income is its size, i.e. the number of people in it. The average income per person usually decreases with the increase in the number of people in the family (Wałęga, 2012, p. 224-229). In large households, it can be seen that the increase in the number of its members is accompanied by a deterioration in the financial situation. In the case of the smallest households, this issue is not so clear-cut. The level of income of small households depends to a large extent on the source of the income. A two-person household of retirees or pensioners will have a decidedly different level of income than a two-person household of self-employed people (Podolec, 2014, p. 12-19).

The diversity of household incomes affects the level and structure of their consumption, the socio-economic situation of households, the living conditions of society and the rate of growth and development of the economy. It is therefore important in both microeconomic and macroeconomic terms (Łacka, 2017, p. 29, 30). Disparities in the distribution of income, and consequently the living conditions and standard of living of the population, are therefore the subject of numerous studies. Many of them confirm that the scale of disparities in the level of income is decreasing as a result of a faster pace of growth of their average level in poorer countries than in richer countries. On the other hand, it is indicated that due to many cultural, technological and institutional conditions and the implemented socio-economic policy, differences in the level of income on the scale of all humanity are increasing (Kołodko, 2014, p. 26). The literature emphasizes that “some differentiation of population income is inevitable and, to some extent, necessary, as it is an element of motivational mechanisms in consumer behaviour” (Grzywińska-Rapca & Kobylińska, 2019, p. 56).

By analysing household income and its diversity, we can assess different categories of income, including the so-called disposable income. This is income from hired work reduced by social and health insurance contributions, income tax and increased by benefits received from the state budget in the form of cash transfers (Wojciuk, 2018, p. 414). It can be used for expenses and savings (Laskowska, 2020, p. 85). Disposable income reduced by some expenses constitutes the household's own income, which is the main source of meeting its needs (Banaszczak-Soroka, 2019, p. 79, 80). Disposable income can be considered as the average income achieved by the household or the average income per member of this household (Muszyńska, 2006, p. 194). Income can be measured at the level of individual people or at the level of the entire household (Brzeziński, 2017, p. 1).

In summary, each household is different and obtains income from different sources, therefore the amount and structure of their income is different. Households of different sizes differ both in terms of the amount of income they earn and the pattern of consumer spending, which is conditioned by different needs and possibilities of fulfilling them.

## Research Results

The level of average monthly disposable income per person in a household in 2014-2021, taking into account different household sizes, is presented in Table 1.

Table 1

Disposable income per person in households of different sizes

Household size	Average monthly disposable income per person in a household (in PLN)							
	2014	2015	2016	2017	2018	2019	2020	2021
1-person	1,974.7	2,049.3	2,078.1	2,135.6	2,260.7	2,397.2	2,533.7	2,738.0
2-person	1,789.3	1,831.6	1,898.1	1,984.9	2,099.4	2,282.0	2,386.9	2,512.2
3-person	1,460.9	1,522.1	1,576.6	1,687.6	1,821.2	1,964.8	2,066.6	2,201.9
4-person	1,210.4	1,245.2	1,342.3	1,498.8	1,572.9	1,675.9	1,799.6	1,939.4
5-person	946.4	999.3	1,116.2	1,257.6	1,338.2	1,450.4	1,514.0	1,623.8
6-person and more	814.0	829.8	985.6	1,142.1	1,187.8	1,259.1	1,327.4	1,496.9

Source: own study based on the Działalność Bazy Wiedzy (2023).

In the years studied, in each type of household, disposable income per person was higher and higher from year to year. In both the first and the last year covered by the analysis, there were significant disproportions in the level of disposable income between the smallest and largest households. Taking into account 2014, the lowest disposable income was achieved by households of 6 or more people (PLN 814), and the highest by 1-person households (PLN 1,974.7). A similar situation occurred in 2021 (the income of households of 6 or more people was PLN 1,496.9 and of 1-person households PLN 2,738). Thus, 1-person households achieved approximately twice as much disposable income per person in all the years studied than households of 6 or more people. In all the years studied, there was also a noticeable pattern that the larger the household, the lower the disposable income per person.

In order to more precisely analyse the level of disposable income in households of different sizes, Table 2 presents the value of the income dynamics indicator in the years 2014-2021.

In all the years studied, the indicator of the dynamics of disposable income per person in a household, in all household sizes, assumed values above 100 and increased year by year. At the turn of 2014-2021, the highest increase in the indicator was recorded in the case of households of 6 and more persons (an increase of 83.9% compared to the base year), and the lowest in single-person households (an increase of 38.7% compared to the base year). The financial situation of all households in the years studied improved significantly, with

Table 2

Dynamics of changes in disposable income by household size

Household size	Dynamics of changes in disposable income per person in households (2014=100)							
	2014	2015	2016	2017	2018	2019	2020	2021
1-person	100.0	103.8	105.2	108.2	114.5	121.4	128.3	138.7
2-person	100.0	102.4	106.1	110.9	117.3	127.5	133.4	140.4
3-person	100.0	104.2	107.9	115.5	124.7	134.5	141.5	150.7
4-person	100.0	102.9	110.9	123.8	129.9	138.5	148.7	160.2
5-person	100.0	105.6	117.9	132.9	141.4	153.3	160.0	171.6
6-person and more	100.0	101.9	121.1	140.3	145.9	154.7	163.1	183.9

Source: own studies based on Table 1.

a higher rate of income growth recorded in the group of households characterized by a lower level. It was therefore possible to notice a regularity that the larger the household, the more its disposable income per person increased, which may be related to, for example, 800+ benefits transferred to children.

As shown, the level of disposable income per person in a household varies depending on the size of the household. To assess the scale of this differentiation, Figure 1 presents the values of the coefficient of variation for individual years.

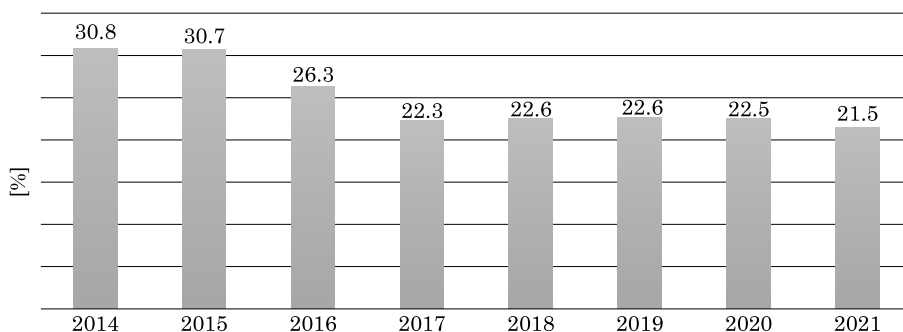


Fig. 1. Coefficient of variation of disposable income of households by their size

Source: own studies based on Table 1.

In the years 2014-2021, the coefficient of variation assumed values from 21.5% (the lowest value in 2021) to 30.8% (the highest value in 2014). In all years, the size of the household significantly differentiated the level of disposable income achieved. Importantly, the values of the coefficient of variation of household income decreased in almost all years. It can therefore be concluded that the differences in the level of disposable income of different sizes of households decreased. A decrease in this differentiation was also noted during the pandemic.

It is also worth noting that the values of the coefficient of variation analysed by household size were significantly higher than in the case of analyses conducted by voivodeship or class of place of residence (Laska, 2023, p. 43-55).

## Summary

Households derive income from various sources, such as employment or social benefits. However, the level of income achieved may be different in different types of households, and may also change over time, due to the changing economic situation in the country, changing inflation or wage levels. In light of the above, the aim of the research was to assess the scale of differentiation of household income in Poland in the years 2014-2021 due to their size. The basis for this assessment was the analysis of changes that occurred in the level of income of different sizes of households in 2014-2021.

The results of the conducted research can be summarized as follows. In the years studied, in each type of household (taking into account its size), disposable income increased. Both in the first and in the last year covered by the analysis, the lowest disposable income was achieved by households of 6 or more people, and the highest income by households of 1 person. The level of income in these households was almost twice as high as in the largest households. It was also noted that larger households recorded a higher rate of growth in the aforementioned income. As a result of the changes taking place, the coefficient of variation assumed values from 21.5% to 30.8% in the years 2014-2021. In all years, the size of the household significantly differentiated the level of disposable income of households, with this differentiation showing a decreasing trend. Interestingly, during the COVID-19 pandemic, the downward trend in this respect was even stronger than in several previous years. It was also noted that the values of the coefficient of variation analysed by household size were significantly higher than in the case of analyses conducted by voivodeship or place of residence class.

Based on the results of the conducted research, it is possible to answer the research question posed, which was: *Has the differentiation of household incomes, taking into account the criterion of their size, increased or decreased in the years 2014-2021?* In answer to this question, it should be stated that in the period under review, the differentiation of incomes by household size decreased, which can be considered a positive trend.

The increase in income of various sizes of households in Poland, with a simultaneous reduction in the scale of differentiation in this area, was reflected in the increase in consumer spending, the change in the structure of consumption, the increase in the level of savings and the improvement in the quality of life of household members. The improvement in the financial situation of the poorest, large families has contributed to the reduction of the scale of poverty in the Polish economy, which is conducive to sustainable economic development.

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## UNEMPLOYMENT IN THE WARMIŃSKO-MAZURSKIE AND WIELKOPOLSKIE VOIVODESHIPS – A COMPARATIVE ANALYSIS

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### Abstract

Unemployment is a phenomenon that has significant consequences for society as well as for the economic development of a country, as it is a problem that manifests in both economic and social dimensions. Notably, there are significant differences in the extent of this phenomenon based on age, gender, place of residence, education, and spatial distribution. The lowest unemployment rate in Poland is observed in the Wielkopolskie voivodeship, while one of the highest is found in the Warmińsko-Mazurskie voivodeship. These differences arise from the distinct demographic, production, and infrastructural structures of these regions. However, the scale of these differences changes over time and may vary across different age groups or gender divisions. In light of the above, the aim of this study was to conduct a comparative analysis of the total unemployment and unemployment by age and gender in the Warmińsko-Mazurskie and Wielkopolskie voivodeships. The analysis covers the period from 2012 to 2022, based on data from the Central Statistical Office.

The conducted research shows that the unemployment rate in the years 2012-2022 (except for 2020) decreased in both voivodeships. In 2022, the unemployment rate in the Wielkopolskie voivodeship was the lowest in the country, while the Warmińsko-Mazurskie voivodeship was in the penultimate position in this respect, right after the Podkarpackie voivodeship. In all the years analyzed, in both regions, a higher share of unemployed people in the number of working-age population was recorded in the case of women, although a downward trend was also noted in this respect. The conducted analyses also showed that throughout the entire period under

review, the lowest unemployment in both analyzed voivodeships occurred among the age group of 35-44 years. Interestingly, in 2022, in the Wielkopolskie voivodeship, the highest unemployment occurred among people aged 18-24, while in the Warmińsko-Mazurskie voivodeship in the age group of 25-34 years.

## **BEZROBOCIE W WOJEWÓDZTWACH WARMIŃSKO-MAZURSKIM I WIELKOPOLSKIM – ANALIZA PORÓWNAWCZA**

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Słowa kluczowe: stopa bezrobocia, bezrobotni według wieku i płci, zróżnicowanie regionalne.

### **A b s t r a k t**

Bezrobocie to zjawisko z dużymi konsekwencjami dla społeczeństwa, a także dla rozwoju gospodarczego państwa, jest ono bowiem problemem występującym zarówno w wymiarze ekonomicznym, jak i społecznym. Co istotne, można zaobserwować znaczące różnice w jego rozmiarach ze względu na wiek, płeć, miejsce zamieszkania, wykształcenie, jak również w układzie przestrzennym. Najniższa stopa bezrobocia w Polsce występuje w województwie wielkopolskim, jedna z najwyższych stóp bezrobocia w Polsce występuje w województwie warmińsko-mazurskim. Różnice te wynikają z odmiennej struktury demograficznej, produkcyjnej czy infrastrukturalnej tych regionów. Skala tych różnic zmienia się jednak w czasie i może być inna w różnych grupach wiekowych społeczeństwa czy w grupach wyodrębnionych ze względu na płeć. Celem badań była analiza porównawcza rozmiarów bezrobocia ogółem oraz ze względu na wiek i płeć w województwach warmińsko-mazurskim i wielkopolskim. Zakres czasowy analizy obejmował lata 2012-2022, a podstawą analizy były dane Głównego Urzędu Statystycznego.

Z przeprowadzonych badań wynika, że stopa bezrobocia w latach 2012-2022 (z wyjątkiem roku 2020) malała w obu województwach. W roku 2022 stopa bezrobocia w województwie wielkopolskim była najniższa w kraju, z kolei województwo warmińsko-mazurskie zajmowało przedostatnią pozycję w tym zakresie, przed województwem podkarpackim. We wszystkich analizowanych latach w obu regionach wyższy udział bezrobotnych w liczbie ludności w wieku produkcyjnym odnotowano w przypadku kobiet, przy czym w tym zakresie również odnotowano tendencję spadkową. Przeprowadzone analizy wykazały również, że w całym badanym okresie najmniejsze bezrobocie w obu analizowanych województwach występowało w grupie wiekowej 35-44 lata. Co ciekawe, w roku 2022 w województwie wielkopolskim największe bezrobocie występowało wśród osób w wieku 18-24 lata, z kolei w warmińsko-mazurskim w grupie wiekowej 25-34 lata.



## Introduction

Unemployment is a phenomenon that occurs when people of working age, who are able and willing to work, remain unemployed despite actively seeking employment (Kwiatkowski, 2018, p. 618, 619). In such cases, the labor supply exceeds the demand for labor (Wiśniewski, 2012, p. 11). The primary measure of unemployment is the unemployment rate, which represents the percentage of unemployed individuals among the economically active population – the total number of employed and unemployed individuals (Wojciechowski, 2008, p. 5; Englama, 2001, p. 2). Unemployment can be analyzed by age, gender, or region. The unemployment level is connected to the GDP of a given region or country and their level of economic development. Simply put, if GDP grows, the unemployment rate decreases (Grzybowski, 2013, p. 13; Andrei *et al.*, 2018, p. 321). Conversely, if a region or country is less economically developed, unemployment is higher and vice versa (Woźniak, 2014, p. 39, 40). The causes of unemployment include (Gębura, 2015, p. 57, 58):

- continuous technological progress, which facilitates the replacement of people with machines, leading to a reduced demand for workers;
- insufficient qualifications of labor market participants relative to the current demand for workers;
- high unemployment benefits compared to wages, resulting in the unprofitability of employment for the unemployed;
- difficulties in finding housing in areas with better employment opportunities,
- seasonal employment.

In addition to the above-mentioned causes of unemployment, other factors may exacerbate the phenomenon. These include (Sowa, 2014, p. 255):

- restructuring processes in enterprises, the liquidation of certain industries;
- reduction in production;
- high costs of conducting business for entrepreneurs;
- low economic development in certain regions of the country;
- the liquidation of small and medium-sized enterprises.

Unemployment is examined in two interconnected aspects: objective and subjective. Objectively, unemployment is considered an economic problem that arises when the labor supply exceeds labor demand, resulting in an imbalance between the labor force and the number of available jobs. The subjective aspect refers to social issues, specifically the situation of individuals affected by unemployment, which leads to a lack of income, threatening their existence (Młonek, 1999, p. 8).

The economic effects of unemployment include (Bilska & Tyczyńska, 2022, p. 10):

- reduced production due to the inefficient use of labor resources;
- the expansion of the so-called gray economy;
- the direct effect of underutilization of production factors;

- decreased state budget revenues;
- financial costs associated with supporting unemployed individuals;
- loss of skills in cases of long-term unemployment.

The social effects of this phenomenon include (Bilska & Tyczyńska, 2022, p. 10):

- numerous social pathologies;
- deteriorating public health;
- emergence of conflicts within families and communities;
- loss of social status;
- a sense of social maladjustment due to reliance on benefits.

In Poland, unemployment rates increased significantly after 1989, linked to the period of transformation, privatization, and the liquidation of unprofitable jobs (Czapski, 2021, p. 87; Lewandowska-Gwarda, 2018, p. 2). Despite the passage of time and changes since the transformation, it should be noted that the spatial differentiation of unemployment in Poland has not changed significantly. In areas that experienced high levels of structural unemployment in the 1990s, this problem persists (Tokarski, 2008, p. 26). The economic situation in individual regions is also influenced by geographical-environmental factors and various socio-economic factors (Malina, 2020, p. 138; Jarosz-Nojszewska, 2018, p. 116). The spatial differentiation of unemployment is a challenging issue for the labor market in Poland. There is a significant difference between the unemployment rate in the *Warmińsko-Mazurskie* and *Wielkopolskie* voivodeships. The *Warmińsko-Mazurskie* voivodeship has one of the highest unemployment rates in Poland (Rokicki, 2016, p. 46). It is also the region with the lowest level of industrialization, partly due to its landscape profile. Agriculture and tourism dominate in this region (Łojko, 2016, p. 59; Batyk, 2011, p. 25). The *Wielkopolskie* voivodeship, on the other hand, has the lowest unemployment rate in Poland and is one of the most industrialized regions in the country (Michoń, 2017, p. 91). The most developed industries in this voivodeship include vehicle manufacturing, foundry, pharmaceutical, furniture, ceramics and glass, tire, textile, and clothing industries (Sass, 2020, p. 59). The voivodeships differ in terms of size, level of economic development, and unemployment rate, hence the comparative analysis of these voivodeships in terms of the characteristics of unemployment present there.

## Research Methodology

The aim of the research was a comparative analysis of overall unemployment levels, as well as by age and gender, in the *Warmińsko-Mazurskie* and *Wielkopolskie* voivodeships. The analysis covered the period from 2012 to 2022. The study employed both vertical and horizontal comparative analysis methods.

The voivodships were compared with each other as well as across different years. The Warmińsko-Mazurskie and Wielkopolskie voivodships were selected for comparative analysis, as they differ significantly in terms of unemployment. Therefore, it was considered that the selection of these voivodships for comparative analysis would be appropriate.

The research utilized data from the Central Statistical Office (GUS), generated from the Local Data Bank (BDL). The analysis focused on the total registered unemployment and the registered unemployment rate. The unemployment rate is calculated as the ratio of the number of unemployed individuals registered at labor offices to the number of economically active civilian population, excluding those performing active military service and employees of budgetary units involved in national defense and public safety activities. The unemployment rate also accounts for those employed in individual agricultural households. Additionally, the number of registered unemployed individuals and their share in the working-age population were analyzed by gender, as well as the share of registered unemployed individuals by age group within the total population of that age. The following age ranges were considered: 18-24 years, 25-34 years, and 35-44 years.

To determine the extent of variation in the registered unemployment rate between the voivodships, the coefficient of variation was used. This measure indicates the percentage share of the absolute measure of variation (standard deviation) in the central value (arithmetic mean). The formula for the coefficient of variation can be expressed as follows (Ręklewski, 2020, p. 52):

$$V_x = \frac{S_x}{\bar{x}} \cdot 100,$$

where:

$S_x$  – standard deviation,  
 $\bar{x}$  – arithmetic mean.

A high coefficient value indicates significant variation and suggests heterogeneity in the studied population, while a low value indicates homogeneity and minimal variation.

To analyze the changes occurring over the studied period in the analyzed indicators, the chain index, also known as the individual variable-base index, was employed. This index indicates how the level of the examined phenomenon changed during the studied period compared to the previous period. The formula for calculating this index is as follows (Ręklewski, 2020, p. 135):

$$I_{t/t-1}^z = \frac{y_t}{y_{t-1}} \cdot 100,$$

where:

$y_t$  – value in the current period,  
 $y_{t-1}$  – value in the previous period.

The unemployment rate in the studied voivodeships was also compared with their GDP per capita to demonstrate the relationship between these categories. It is widely known that the level of economic development is linked to unemployment. Economic development is often narrowly analyzed through the growth of production volume measured by GDP or national income per capita and its structure (Woźniak, 2014, p. 39, 40). Among the measures of socio-economic development, GDP per capita is predominant, along with aspects related to education, healthcare, and increasingly, broad environmental awareness (Sobczak, 2020, p. 37, 38). In this article, GDP per capita was used as a measure of the economic development level of the studied voivodeships. The data were obtained from the Local Data Bank.

## Research Results

Both the Wielkopolskie and Warmińsko-Mazurskie voivodeships stand out in terms of unemployment rates. To provide a closer look at the situation in these regions, Table 1 presents the registered unemployment rate across all voivodeships in Poland from 2012 to 2022. The degree of variation in unemployment rates among the voivodeships and the changes occurring in this regard were also examined.

During the analyzed period, the registered unemployment rate in Poland and its individual voivodeships significantly decreased. Throughout almost the entire period, specifically from 2012 to 2020, the Warmińsko-Mazurskie voivodeship had the highest unemployment rate. Only in the years 2021-2022 did the Podkarpackie voivodeship record a higher unemployment rate. The Wielkopolskie voivodeship had the lowest unemployment rate in Poland throughout the entire analyzed period. However, the gap between the analyzed voivodeships significantly narrowed. In 2012, the unemployment rate in the Warmińsko-Mazurskie voivodeship was 21.3%, while in the Wielkopolskie voivodeship it was 9.8%, resulting in a gap of 11.5 percentage points. In comparison, in 2022, the unemployment rate in the Warmińsko-Mazurskie voivodeship was 8.6%, and in the Wielkopolskie voivodeship, it was 2.9%, resulting in a difference of 5.7 percentage points. The unemployment rate in the Warmińsko-Mazurskie voivodeship decreased by almost 60% over the entire period, while in the Wielkopolskie voivodeship, it decreased by about 70%. It is worth noting that in each voivodeship, the unemployment rate increased in 2020 due to the crisis caused by the COVID-19 pandemic. It can also be observed that the variation in unemployment rates among the voivodeships is growing. Up until 2015, this variation could be described as small, while in subsequent years, it can be considered moderate. Despite the decreasing unemployment rate, the voivodeships are becoming more varied in this regard, meaning that their collective is becoming increasingly heterogeneous.

Table 1

Total registered unemployment rate and coefficient of variation in Poland in 2012-2022

Voivodeship	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	%	%	%	%	%	%	%	%	%	%	%
Dolnośląskie	13.5	13.1	10.4	8.5	7.2	5.7	5.2	4.6	5.6	4.9	4.5
Kujawsko-Pomorskie	18.1	18.2	15.5	13.2	12	9.9	8.8	7.9	9	8.1	7.3
Lubelskie	14.2	14.4	12.6	11.7	10.3	8.8	8	7.5	8.2	8.7	8
Lubuskie	15.9	15.7	12.5	10.5	8.6	6.5	5.8	4.9	6.3	5.1	4.4
Łódzkie	14	14.1	11.8	10.3	8.5	6.7	6.1	5.4	6.2	6.1	5.5
Małopolskie	11.4	11.5	9.7	8.3	6.6	5.3	4.7	4.1	5.3	5	4.4
Mazowieckie	10.7	11.1	9.6	8.3	7	5.6	4.9	4.4	5.2	4.7	4.3
Opolskie	14.4	14.2	11.8	10.1	9	7.3	6.3	5.8	6.9	6.4	5.9
Podkarpackie	16.4	16.3	14.6	13.2	11.5	9.6	8.7	7.9	9.1	9.9	8.8
Podlaskie	14.7	15.1	12.9	11.8	10.3	8.5	7.7	6.9	7.8	7.8	7
Pomorskie	13.4	13.2	11.1	8.9	7.1	5.4	4.9	4.5	5.9	5.2	4.6
Śląskie	11.1	11.3	9.6	8.2	6.6	5.1	4.3	3.6	4.9	4.3	3.7
Świętokrzyskie	16	16.6	14.1	12.5	10.8	8.8	8.3	8	8.5	8.7	7.8
Warmińsko-Mazurskie	21.3	21.6	18.7	16.2	14.2	11.7	10.4	9.1	10.2	9.1	8.6
Wielkopolskie	9.8	9.6	7.6	6.1	4.9	3.7	3.2	2.8	3.7	3.2	2.9
Zachodniopomorskie	18.2	18	15.5	13.1	10.9	8.5	7.4	6.8	8.4	7.3	6.7
Standard deviation [p.p.]	3.07	3.10	2.82	2.60	2.48	2.17	1.99	1.87	1.84	2.01	1.87
Arithmetic mean [%]	14.6	14.6	12.4	10.7	9.1	7.3	6.5	5.9	6.9	6.5	5.9
Coefficient of variation [%]	21	21	23	24	27	30	30	32	26	31	32

Source: own study based on the Local Data Bank (2024).

Differences between the studied voivodships are also evident when considering the number of registered unemployed individuals and their share of the working-age population by gender (Tab. 2).

The number of unemployed women and men in both voivodships decreased year by year. The exception was 2020, when the number of unemployed individuals increased compared to 2019. This increase was more pronounced among men. In the Warmińsko-Mazurskie voivodeship, the number of unemployed men increased by 20% that year, while the number of unemployed women rose by 7%. In the Wielkopolskie voivodeship, the number of unemployed men increased by as much as 39%, and the number of unemployed women by 27%. Thus, the number of unemployed people in 2020 grew more in the Wielkopolskie voivodeship, although it still remained the region with the lowest unemployment rate in Poland.

Table 2

Number of unemployed persons and their share in the working-age population (by gender)

Specification		Warmińsko-Mazurskie voivodeship			Wielkopolskie voivodeship		
		number of unemployed in thousands of people	rate of change	share in the working-age population [%]	number of unemployed in thousands of people	rate of change	share in the working-age population [%]
Men	2012	-	-	10.9	-	-	5.7
	2013	-	-	11.3	-	-	5.6
	2014	47,154	-	9.6	50,568	-	4.4
	2015	39,427	84	8.1	39,504	78	3.4
	2016	33,452	85	6.9	31,981	81	2.8
	2017	26,186	78	5.5	23,091	72	2
	2018	22,447	86	4.7	19,415	84	1.7
	2019	19,222	86	4.1	18,327	94	1.6
	2020	23,040	120	5.1	25,410	139	2.3
	2021	18,548	81	4.2	20,250	80	1.8
	2022	18,528	99,9	4.3	19,144	95	1.8
Women	2012	-	-	13.3	-	-	7.7
	2013	-	-	13.7	-	-	7.6
	2014	50,985	-	11.8	65,842	-	6.3
	2015	44,083	86	10.3	53,807	82	5.2
	2016	39,627	90	9.4	45,716	85	4.5
	2017	33,817	85	8.1	35,766	78	3.5
	2018	30,694	91	7.5	31,452	88	3.2
	2019	26,509	86	6.6	27,986	89	2.8
	2020	28,435	107	7.4	35,548	127	3.6
	2021	24,019	84	6.4	29,600	83	3
	2022	22,541	94	6	27,145	92	2.8

Source: own study based on the Local Data Bank (2024).

Importantly, throughout the entire period under study, the share of unemployed women in the working-age population was higher than that of men in both voivodeships. The unemployment rate among women has consistently remained higher than among men. Labor market studies indicate that employers are more likely to hire men than women, and that men hold a privileged position in the labor market, while women face discrimination despite often being better educated. It is also worth noting that the share of unemployed men and women in the working-age population has decreased in both voivodeships, although it remains significantly higher in the Warmińsko-Mazurskie voivodeship.

In 2022, this share for men was 4.3% in the Warmińsko-Mazurskie voivodeship (a decrease of 6.6 percentage points compared to 2012) and 1.8% in the Wielkopolskie voivodeship (a decrease of 3.9 percentage points compared to 2012). For women, the share was 6% in the Warmińsko-Mazurskie voivodeship (a decrease of 7.3 percentage points compared to 2012) and 2.8% in the Wielkopolskie voivodeship (a decrease of 4.9 percentage points compared to 2012).

The next important issue is the number of unemployed individuals by age. Differences in this regard in the studied voivodships are presented in Table 3.

In each age group, the share of registered unemployed individuals is lower in the Wielkopolskie voivodeship than in the Warmińsko-Mazurskie voivodeship. In every group, the share of unemployed individuals decreased year by year, with the exception of 2020. When analyzing the Warmińsko-Mazurskie voivodeship, it is worth noting that in 2012, the highest share of unemployed was recorded in the 18-24 age group, while ten years later, the highest share was seen in the 25-34 age group. In contrast, in the Wielkopolskie voivodeship, the highest percentage of unemployed was recorded in the 18-24 age group in both 2012 and 2022. High unemployment in this age group results from an unstable life situation, lack of experience, or insufficient qualifications required by employers. In both voivodships, the smallest percentage of unemployed individuals was found in the 35-44 age group. This is likely due to the fact that people in this age group generally have a stable life and career situation. This is particularly true for women, who have often completed the child-rearing phase and are more readily employed by employers.

Table 3

Share of registered unemployed by age group in the population of that age group

Specification			Warmińsko-Mazurskie voivodeship	Wielkopolskie voivodeship
1			2	3
18-24 years old	2012	%	15.6	10
	2013	%	15.6	9.3
	2014	%	12.3	6.6
	2015	%	10	5.2
	2016	%	7.9	4
	2017	%	6.3	3
	2018	%	6	2.6
	2019	%	5.5	2.5
	2020	%	6.7	3.3
	2021	%	5.4	2.5
2022	%	5.8	2.9	

cont. Table 3

1			2	3
25-34 years old	2012	%	13.7	7.6
	2013	%	13.5	7.2
	2014	%	11.5	5.9
	2015	%	9.9	4.7
	2016	%	8.8	4
	2017	%	7.4	3.2
	2018	%	6.8	2.8
	2019	%	6	2.6
	2020	%	7.5	3.5
	2021	%	6.3	2.8
	2022	%	6	2.4
35-44 years old	2012	%	11.3	5.7
	2013	%	11.4	5.7
	2014	%	9.9	4.6
	2015	%	8.2	3.6
	2016	%	7.3	3
	2017	%	6.1	2.4
	2018	%	5.3	2.1
	2019	%	4.4	1.9
	2020	%	5.3	2.6
	2021	%	4.5	2.2
	2022	%	4.5	2

Source: own study based on the Local Data Bank (2024).

The level of unemployment is strongly correlated with the level of GDP per capita. Simply put, when unemployment is high, Gross Domestic Product decreases. Conversely, a decrease in unemployment leads to an increase in GDP. Table 4 presents data on GDP per capita in the studied voivodeships and relates it to the changes that have occurred in the unemployment rate.

A high GDP per capita indicates the prosperity of residents and a high level of development in a given region. According to GUS data, the GDP per capita level in the Wielkopolskie voivodeship is one of the highest in Poland. In 2022, the GDP per capita in this region was nearly 86,000 PLN, placing the voivodeship third in the ranking of regions by GDP per capita. This means that it is one of the most developed regions in Poland. Only the Mazovian and Lower Silesian voivodeships have better standings in this regard. In 2022, the GDP per capita in the Warmińsko-Mazurskie voivodeship was approximately 56,000 PLN, ranking it 14th in Poland, indicating that this region is among



Table 4

Gross Domestic Product per capita in the Warmińsko-Mazurskie and Wielkopolskie voivodeships in 2012-2022

Specification		Warmińsko-Mazurskie	Wielkopolskie
GDP per capita	2012	PLN 30,068	44,342
	2013	PLN 30,456	45,445
	2014	PLN 31,973	47,529
	2015	PLN 33,351	50,822
	2016	PLN 34,556	52,744
	2017	PLN 36,449	56,448
	2018	PLN 38,271	59,865
	2019	PLN 40,810	64,801
	2020	PLN 43,662	66,499
	2021	PLN 49,098	74,224
	2022	PLN 56,368	85,867

Source: own study based on the Local Data Bank (2024).

the least developed in the country. Even such a simple analysis can be the basis for concluding that the low GDP per capita in the Warmińsko-Mazurskie voivodeship may be partly due to the high unemployment rate, while the high value of this indicator in the Wielkopolskie voivodeship may result from the low unemployment rate in that region.

## Summary

Based on the conducted research, it was found that the unemployment rate in both analyzed voivodeships decreased between 2012 and 2022, with the exception of 2020, when the COVID-19 pandemic broke out. Until 2020, the Warmińsko-Mazurskie voivodeship had the highest registered unemployment rate in Poland, while the Wielkopolskie voivodeship enjoyed the lowest unemployment rate in the country throughout the entire period. In 2022, the unemployment rate in the Warmińsko-Mazurskie voivodeship was 8.6%, while in Wielkopolskie, it was 2.9%.

In all the analyzed years, both regions recorded a higher share of unemployed women in the working-age population, which may be linked to, among other factors, gender discrimination in the labor market. In 2012, the share of unemployed women in the working-age population was 13.3% in the Warmińsko-Mazurskie voivodeship and 7.7% in the Wielkopolskie voivodeship, while in 2022, it was 6% and 2.8%, respectively. The share of unemployed men in the working-age population was lower, amounting to 10.9% in the Warmińsko-Mazurskie

voivodeship and 5.7% in the Wielkopolskie voivodeship in 2012, and decreasing to 4.3% and 1.8% in 2022. This downward trend confirms the improvement in the labor market situation in both regions.

The analysis also revealed that throughout the entire period, the lowest unemployment in both voivodeships was observed in the 35-44 age group. In the Warmińsko-Mazurskie voivodeship, the highest unemployment in 2012 was among individuals aged 18-24, while ten years later, it shifted to the 25-34 age group. In the Wielkopolskie voivodeship, the highest unemployment was consistently among those aged 18-24. Thus, the younger generation faces more challenges in the labor market, largely due to the transition from education to work and the lack of experience required by employers.

The research also provided information on the GDP per capita in the analyzed voivodeships. The Wielkopolskie voivodeship has a high GDP per capita, indicating a high standard of living for its residents. It is a highly developed and urbanized region with a diverse and robust labor market, as evidenced by its low unemployment rate. In contrast, the Warmińsko-Mazurskie voivodeship has a relatively low GDP per capita and a high unemployment rate. It can therefore be concluded that differences in unemployment rates in the studied regions are determined, among other factors, by the varying levels of their socio-economic development, differences in employment structures, uneven changes in labor demand, differences in the education levels of the population, as well as historical and natural conditions.

Translated by Authors

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