URSZULA MOTOWIDLAK

SOCIAL ACCEPTANCE FOR THE IMPLEMENTATION OF NEW MOBILITY CONCEPTS IN POLAND

JEL Codes: R42, R58

Summary: The aim of the article is to assess the level of Poles' social acceptance of development of new mobility concepts favoring the transport decarbonisation. On the basis of the literature review on the subject and the survey's results, the basic conditions for the implementation of solutions, aimed at developing a new quality of transport, were presented. It was emphasized that they are a outcome of scientific and development research, cooperation of enterprises, partnership between interested institutions and social dialogue. Next, the article's focus was on the potential of electromobility in pursuit of the circular economy development. Market and social acceptance for this concept of mobility in Poland was assessed. The presented survey results confirmed high interest in new technologies in the automotive industry. At the same time, too high EV prices and the lack of adequate charging infrastructure are still the key barriers to the development of electromobility in Poland.

Key words: transport decarbonisation, new concepts of mobility, behavioral changes, electromobility.

1. INTRODUCTION

Changing the current model of transport and achieving the objectives defined in the White Paper [COM(2011) 144] as regards limiting the dependence on fossil fuels and reducing CO_2 emissions are not only the issues of technological solutions, but they also require the development and implementation of new mobility concepts. Recognising the contemporary problems of transport operation releases the need for multifaceted analyses and interdisciplinary studies aimed at developing new quality of transport [Załoga 2013]. A multifaceted approach to issues related to sustainable energy management in the transport sector is supported by the findings of the research conducted [Litman 2015, Faberi 2018]. The new quality of low-emission transport should be developed as a result of deepened

convergence as regards technological innovations, organisational improvements and behavioural changes.

For a long time now, changes in transport-related social behaviour have been considered an important instrument, which can strengthen the activities undertaken towards energy efficiency in the short term. On the other hand, in the long term, and along with strengthening sustainable mobility patterns and popularising technological and informational innovations, these changes are to determine the development of the new quality of transport and logistics.

The aim of this article is to assess the level of social acceptance in Poland as regards the development of new mobility concepts favouring decarbonisation of transport.

2. CONDITIONS FOR THE DEVELOPMENT OF NEW MOBILITY CONCEPTS IN POLAND

Reflections on the future mobility system constitute a part of a wider trend of changing the way means of transport are used. Along with generation changes, we can clearly observe weakening of the need to own a car. The no driving licence trend has already been visible in the USA, and it is assumed to appear in Europe soon [Rzędowska 2017]. Statistics show [Eurostat 2018] that, over the last decade, the motorisation rate growth has slowed down evidently in Western Europe. On the other hand, France recorded a turning point as regards the upward trend for the number of passenger cars per 1,000 inhabitants. As Poland stayed outside the mainstream global economy for many years, the Polish society has developed a strong need to own cars. However, changes in the way of perceiving mobility are also observed in the Polish society, and, in particular, in large cities. The way of mobility organisation changes thanks to new technologies, business models and changes in consumer behaviours [Szoltysek 2011]. These changes are manifested, for example, in the rapid development of economy based on collaborative consumption as regards mobility. Currently, the society is looking for new mobility variants, which will more efficiently satisfy the need of movement and have a positive influence on air quality in urban areas, health and climate changes.

Mobility is more and more often perceived as a service, and consumers expect better quality, greater convenience, flexibility and price accessibility. In order to meet these expectations, it is necessary to change from the current fragmentary transport networks to an integrated and innovative transport system connected to the power grid and digital network. One of crucial requirements of contemporary mobility is effective use of time. The research findings regarding travel behaviour of the inhabitants of Polish cities [Ciastoń-Ciulkin, Puławska 2014] show that the key factor behind the decision to give up using one's own car is the opportunity to integrate various forms of transport. Other issues of significant importance are modernising the public transport offer and providing public transport connec-

tions with suburban areas. For 59% of the respondents commuting to work from small towns and villages, the opportunity to leave their vehicles at Park&Ride car parks as part of their monthly tickets is a sufficient incentive to change their means of transport.

Simultaneously, the growth in importance of public transport use in favour of reducing passenger vehicle traffic in city centres and positive trends regarding its integration with other means of transport reduce environmental threats related to air pollution and CO_2 emissions. The essence of these threats was noticed by the inhabitants of the Łódź urban agglomeration participating in the research concerning the evaluation of urban transport operation and the availability of innovative transport solutions [Motowidlak 2016]. With the use of the contingent valuation method (*Willingness to Pay*, WTP), the air quality in cities was valued. WTP defines the amount of money that an individual would be able to pay extra for an environment of a specified quality with the same level of welfare being maintained [Fiedor, Czaja, Graczyk, Jakubczyk 2002]. Quality valuation of the environment using WTP confirmed the respondents' inclination to pay higher fees for the opportunity to take advantage of innovative transport solutions, which reduce the negative impact of transport on air quality in cities and climate changes. This willingness increased with the level of education and the income level.

The research in the Łódź urban agglomeration, which was repeated in May 2018, showed that there were no significant differences in the respondents' opinions regarding the evaluation of the issues lying at the heart of the provision of clean air and reduction of CO_2 emissions. According to 74% of the respondents, the said issues constituted an important problem. The importance of the need to improve air quality and reduce CO_2 emissions from transport was indicated by 82% of the respondents, i.e. by 8 percentage points more in comparison with 2016. Moreover, 63% of the respondents opted for the introduction of clean transport zones pursuant to the amended Act on Biocomponents and Biofuels [Form No. 834 2018] and the Act on Electromobility and Alternative Fuels [Journal of Laws 2018, item 317]. Pursuant to its resolution establishing a clean transport zone, the city council shall have the right to allow movement in the said zone, within a period of 3 years at the most following the date of adopting the resolution, for vehicles other than those authorised to enter the zone free of charge (electric, hydrogen and natural gas vehicles) provided that a relevant fee is paid. The clean transport zone entrance fee shall not be higher than PLN 2.50 per hour and it shall be collected between 9 a.m. and 5 p.m. Moreover, the research confirmed the respondents' strong interest in alternative forms of transport, mainly carpooling and bikesharing. Over 70% of the respondents declared that they had taken advantage of such solutions. An alternative solution which enjoyed the greatest interest from among those available in Łódź was the city bike offer, which was confirmed by more than 80% of the respondents. According to 64% of the respondents, the main factor persuading them to use alternative forms of transport was their availability.

The use of mobility services based on rental and shared use is gaining in importance. The development of carsharing is also the answer to the more and more clear need to change the centre of gravity from long-distance road transport into rail transport. From the passengers' viewpoint, commuting to another town or city by train and using in this location of car (e.g. electric car) rental service, preferably with the same ticket, is comfortable and faster than commuting in one's own vehicle. The research conducted by the Boston Consulting Group shows that the inhabitants of the European Union (EU) spend 10 hours a week on average using different means of transport, covering a daily distance of around 37.5 km [COM(2017) 283].

The findings of the research [Plan 2017] evaluating the travel behaviour of the inhabitants of Polish towns and cities show that quality improvement of public transport services (travel time, availability, comfort) is a greater incentive to change one's means of transport than instruments discouraging people from travelling by their own vehicles (speed limits, higher numbers of one-way streets, no left turns). This provides space for the implementation of electromobility concepts in public transport. Electric buses, in conjunction with electric cars, which are popularised in new business models, may be the response to the changing needs of the inhabitants, which shall result in the increase of the traffic flow smoothness in cities and improvement of air quality. Undertaking such activities is closely connected with the development of low- and zero-emission transport, which constitutes the key element of the low-carbon circular economy.

3. THE POTENTIAL OF ELECTROMOBILITY

Examination of the impact of behavioural changes on the process of transport decarbonisation is a relatively new direction of research. According to the reports prepared by CE Delft [2012] and DG MOVE [2015], there are certain crucial changes in travel behaviour, which demonstrate a high emission reduction potential. One of them is the increased preference for the implementation of new technologies in the motorisation sector. In the opinion of the reports' authors, the most favourable to the environment at a given stage of technological development are electric vehicles (EV), which do not emit pollution while on the move. The figures presented in Table 1 show that, by 2050, driving battery electric vehicles (BEV) may contribute to the reduction of CO_2 emissions even up to 90% per passenger-kilometre (pkm). In the case of plug-in hybrid electric vehicles (PHEV), however, this reduction may reach the maximum of 69%/pkm. The potential CO_2 emissions savings are determined by, inter alia, the method of obtaining electricity. Hence, EV users in Poland, where 90% of electricity is produced from hard coal and lignite, are going to reach a completely different level of CO_2 emissions reduction than, for example, in France, where 50% of energy is nuclear energy, or in Germany, where renewable energy sources account for 30% of energy generation.

Table 1. CO_2 reduction potential resulting from the use of BEV and PHEV electric vehicles

EV use	2020	2030	2050
BEV use: CO_2 reduction potential/pkm Maximum CO_2 reduction potential (Mt)	 19-34% 96-174	 64-72% 330-371	 82-90% 420-462
PHEV use: CO_2 reduction potential/pkm Maximum CO_2 reduction potential (Mt)	 11-22% 56-113	 39-56% 198-286	 49-69% 251-354

Source: [Schroten 2012].

When analysing the potential benefits of electricity-powered cars, several significant advantages should be indicated. Firstly, the users become independent of petroleum-derived fuel deliveries and prices, and, moreover, gearboxes and mechanisms responsible for distributing oil around the engine are removed from cars. What is more, electric motors demonstrate a considerably higher efficiency than combustion engines [Bielecki 2016]. Furthermore, in favour of such vehicles are the operating costs, as in order to cover a distance of 100 km, you need a few Polish zlotys depending on the energy tariff. The use of electric vehicles is an economical alternative for conventionally-powered vehicles if you cover more than 50,000 km per year. However, in the case of smaller numbers of kilometres covered in a year, the lower costs of EV operation do not compensate for the higher buying price. Simultaneously, the limited lifetime of batteries, which need to be changed every few years, the limited range and no extensive network of charging stations persuade the European countries to implement various incentives to support the growth of interest in EV purchasing (Table 2).

Electric vehicles are ready-to-use solutions, which may help the EU to achieve the objectives set in the Paris Agreements as of 2015. Definitely, the automotive industry has began to make investments in electricity-powered cars, and the number of customers deciding to buy such vehicles is growing dynamically. According to the data provided by the International Energy Agency (IEA) [2017], in 2017, the number of electric vehicles (BEV, PHEV and FCEV) worldwide reached the level of 3.1 million, which means an increase by 54% in comparison with 2016. In 2017, customers from the EU purchased 216,566 electric vehicles, i.e. by 39% more than the year before (155,757 vehicles). The largest number of electric vehicles were sold in Germany (54,617), Great Britain (47,298) and France (36,835).

The number of electric vehicles registered keeps on growing dynamically. In the first quarter of 2018, 69,898 electric vehicles were registered in the EU, which meant an increase by 47% in comparison with a corresponding period of 2017. According to the statistics of the European Automobile Manufacturers' Association [ACEA 2018], the number of in-service electric vehicles on the European market will have exceeded one million as early as in the second quarter of 2018.

Table 2. Types of support for EV market development in selected European countries (as of 03.2018)

Country	1	2	3	4	5	6	7	8
Austria	x	x	x	x	x		x	
Bulgaria								
Czech Republic		x	x					
Denmark	x	x		x			x	x
France	x	x	x	x			x	
Germany	x		x	x		x	x	
Hungary		x	x	x			x	
Italy	x		x					x
Lithuania							x	
Netherlands		x	x	x				
Norway		x	x	x	x	x	x	x
Poland		x	x	x			x	x
Slovakia	x	x					x	
Sweden	x		x	x				
Great Britain	x	x	x	x			x	x

Explanations: (1) incentives by buying cars, (2) excise tax relief, (3) tax relief for natural persons, (4) corporate tax relief, (5) VAT relief, (6) other financial incentives, (7) local incentives and (8) financial incentives for the development of charging points.
Source: [ING & EY 2018].

The share of electric vehicles in the car market is still minimal and it amounts to around 0.1%. In 2017, 438 battery electric vehicles (BEV) were registered in Poland, which denoted an increase by over 300% in comparison with 2016. At the same time, the number of plug-in hybrid electric vehicles (PHEV) increased by 585, i.e. by nearly 45% in comparison with 2016. According to the report prepared by ACEA, the growth dynamics of BEV sales were among the highest in the member states of the European Union. The growth dynamics of EV sales in the first quarter of 2018 gives indication that an electromobility ecosystem is arising in Poland (Table 3). The number of battery electric vehicles registered in that quarter was 152, which was an increase by 130.3% in comparison with a corresponding period of 2017 (66 vehicles). Simultaneously, PHEV demand in the first quarter of 2018 increased by 102.2% (188 vehicles) in comparison with the first quarter of 2017 (93 vehicles).

Table 3. Sales of new BEVs and PHEVs in EU Member States in the first quarter of 2017 and 2018

Country	BEV			PHEV		
	Q1 2017	Q1 2018	Change %	Q1 2017	Q1 2018	Change %
Austria	1,226	1,599	30.4	280	653	133.2
Belgium	788	914	16.0	2,353	3,067	30.3
Bulgaria	0	48	-	2	7	250.0
Czech Republic	112	133	18.8	-	82	-
Denmark	55	194	252.7	30	851	2,736.7
Estonia	13	12	-7.7	4	6	50.0
Finland	129	175	35.7	476	1,309	175.0
France	7,404	7,322	-1.1	1 943	3,586	84.6
Greece	4	17	325.0	33	50	51.5
Spain	588	1,153	96.1	420	1,046	149.0
Netherlands	1,667	3,945	136.7	338	560	65.7
Ireland	298	282	-5.4	137	291	112.4
Lithuania	11	13	18.2	-	-	-
Latvia	5	11	120.0	8	10	25.0
Germany	5,064	9,127	80.2	5 264	8,447	60.5
Poland	66	152	130.3	93	188	102.2
Portugal	369	726	96.7	389	794	104.1
Romania	11	195	1672.7	-	-	-
Slovakia	33	55	66.7	-	-	-
Slovenia	58	103	77.6	16	67	318.8
Sweden	1,048	1,250	19.3	2 762	4,960	79.6
Hungary	119	311	161.3	65	170	161.5
Great Britain	4,654	3,895	-16.3	8 155	10,267	25.9
Italy	529	934	76.6	532	921	73.1
EU	24,251	32,566	34.3	23 300	37,332	60.2

Source: [ACEA 2017].

According to the government plans regarding electromobility development in Poland, there are going to be as many as around 70,000 EVs in 2020, and their number is to reach one million in 2025 [Plan 2016]. Currently, these assumptions seem to be very ambitious. Therefore, the development of a low-emission electromobility system integrated in a network is a challenge for Polish politicians.

4. KNOWLEDGE AND PURCHASE DECISIONS VS. ELECTROMOBILITY DEVELOPMENT IN POLAND

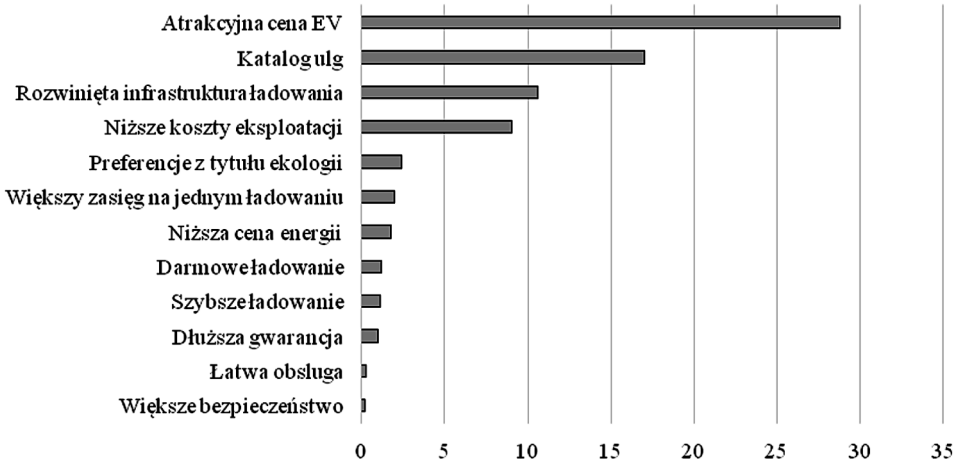
Smooth functioning of societies, as well as expectations and requirements established by them make us look for innovative concepts of mobility. Innovations and business models in transport change thoroughly thanks to the new generation of consumers, who expect value co-creation. Digitisation, automation and alternative sources of energy create new opportunities connected with effective resources management in transport and collaborative economy. At the same time, they transform the traditional transport processes, which results in the creation of new models of institutions in the form of networks of public and non-public entities. This means changing from the current fragmentary transport networks to an integrated network of innovative transport solutions. The effectiveness of this network operation requires the co-operation of all entities at different levels, i.e. government institutions, municipal and local authorities, the industry and social partners. The combination of resources and initiation of interactions between complex networks of political, economic and social stakeholders, defined as multi-level governance [Nawojczyk 2015], favours the quality improvement of decision-making processes and the development of new mobility concepts. The coordination of activities among numerous levels of authority is of particular importance in the case of the electromobility system development, as the key resources, i.e. information, skills, time and money, as distributed among different stakeholders of the public and private sectors.

The Electromobility Development Plan [2016], which was adopted by the Polish government, and according to which vehicles with alternative drive systems are to be used more commonly, is constructed on the grounds of knowledge-based economy and with the use of instruments applied parallelly in several interconnected areas. In the context of reviewing the opinions on the issues lying at the heart of advantages determining the success in a global environment, intended advantages are gaining in importance [Rogut 2009]. Chances of a breakthrough when it comes to innovation are visible, in particular, in those countries in which the objectives and directions of actions have been agreed on by business, the state, science and the society. Finally, it will be the behavioural choices made by people travelling that will determine their adaptation and diffusion. In the case of electric vehicles and vehicles with other alternative power sources, popularisation of knowledge about their advantages among the potential users could stimulate consumers when making their choices.

Assessment of Polish people's ability to make more conscious purchase choices and analysing their interest in electrical vehicles are the objectives of numerous studies conducted for public institutions, as well as entities from the automotive industry and the energy sector. The research findings unambiguously confirm the increase in the number of Polish people interested in new technologies as regards motorisation. The Polish Alternative Fuels Association (PSPA) has presented in

its annual report [2018] the purchasing potential of Polish people as regards EV purchasing and charging infrastructure preferences. In the research, 17% of the respondents considered buying a BEV within the next three years, which is more by 5 percentage points in comparison with the findings of the 2017 research. Because of the low BEV share in the automotive market and no appropriate charging infrastructure, the respondents showed a continuously high interest in buying traditional hybrid vehicles (28%). The reasons for the small number of new electric vehicles (BEVs and PHEVs) registered in Poland are the high costs of purchasing them, which was confirmed by the respondents' answers. The respondents admitted that they could earmark between PLN 80,000 and 90,000 for such a vehicle, which is much below the list prices of new electric vehicles available on the Polish market. On average, an electric car in Poland is twice as expensive as its conventional equivalent. Simultaneously, when it comes to theoretical purchasing of specific EV models, the majority of respondents would choose an electric vehicle instead of its conventionally-powered equivalent, having obtained other measurable benefits (Figure 1). According to the respondents, the most important of those benefits included VAT exemption and the opportunity to receive external funding amounting between PLN 5,000 and 10,000.

Figure 1. The importance of incentives for respondents [%]



Source: [PSPA 2018].

POLISH	ENGLISH
Atrakcyjna cena EV	Attractive EV prices
Katalog ulg	Catalogue of reliefs
Rozwinięta infrastruktura ładowania	Well-developed charging infrastructure
Niższe koszty eksploatacji	Lower operating costs
Preferencje z tytułu ekologii	Ecology-related preferences
Większy zasięg na jednym ładowaniu	Longer range per charge

POLISH	ENGLISH
Niższa cena energii	Lower energy prices
Darmowe ładowanie	Free charging
Szybsze ładowanie	Faster charging
Dłuższa gwarancja	Longer guarantee period
Łatwa obsługa	Easy operation
Większe bezpieczeństwo	Better safety

The key factor that could convince every tenth respondent to buy an electric vehicle was better developed charging infrastructure. At the same time, the benefits of using EVs, which are important for the implementation of the climate and energy policy, were confirmed in their purchase decisions only by around 2.5% of the respondents.

5. SUMMARY

The low-emission transport operation and development of new mobility concepts shall undergo changes thanks to new technologies and social choices. These changes may also be favoured by multi-level management of relationships among different stakeholders. Successful and effective use of administrative and economic instruments can accelerate the process of transport transformation towards low-carbon circular economy. Simultaneously, the implementation of new mobility concepts, including electromobility integrated in a network, may be the source of intended advantages, being the product of research, cooperation of enterprises, partnership among interested institutions and social dialogue. A new approach to transport organisation requires preparations and implementation of a long-term action strategy, mainly on the part of government and local administrative authorities. The high prices of electric vehicles and the shortage of charging points are still the basic barriers, because of which Polish people have a conservative approach to the development of electromobility. At the same time, however, these barriers confirm the interest in popularisation of new transport solutions.

BIBLIOGRAPHY

- *Barometr elektromobilności*, 2018, Raport, PSPA, Warszawa.
- *Biała księga. Plan utworzenia jednolitego europejskiego obszaru transportu – dążenie do osiągnięcia konkurencyjnego i zasobooszczędnego systemu transportu*, COM(2011) 144, Bruksela 2011.
- Bielecki S., 2016, *Pojazdy elektryczne jako mobilne źródła mocy biernej*, „Przegląd Elektrotechniczny" nr 11.

- Ciastoń-Ciulkin A., Puławska S., 2014, *Badania zachowań transportowych w miastach z wykorzystaniem Internetu*, „Logistyka", nr 6.
- Faberi F., 2018, *Multi-level governance: linking up local, regional and national levels to deliver integrated sustainable energy action plans and projects*, http://www.odyssee-mure.eu/, [07.03.2018].
- Fiedor B., Czaja S., Graczyk A., Jakubczyk Z., 2002, *Podstawy ekonomii środowiska i zasobów naturalnych*, Wydawnictwo C.H. Beck, Warszawa.
- Global EV outlook 2017, IEA 2017.
- http://ec.europa.eu/eurostat/web/transport/data/database, [05.06.2018].
- *Którym pasem zamierzamy jechać? Samochody elektryczne*, Raport, ING i EY, 2018.
- Litman T., 2015, Smart Transportation Emission Reductions Strategies, *Identifying Truly Optimal Ways To Conserve Energy And Reduce Emissions,* Victoria Transport Policy Institute.
- Motowidlak U., 2016, *Analyse der sozialen Akceptanz der modernen Kommunikationslösungen*, „Problemy Transportu i Logistyki", nr 3 (35).
- Nawojczyk M., 2015, *Nowoczesne formy zarządzania w administracji publicznej*, Zeszyty Naukowe Wyższej Szkoły Humanitas „Zarządzanie" nr 2.
- New passenger cars by fuel type in the European Union Quarter 1 2018**,** ACEA, http://www.acea.be**, [**15.05.2018].
- *Plan rozwoju elektromobilności w Polsce*, 2016, Ministerstwo Energii, Warszawa.
- *Program działań na rzecz sprawiedliwego społecznie przejścia do czystej, konkurencyjnej i opartej na sieci mobilności dla wszystkich*, COM(2017) 283 final, Bruksela.
- Rogut A. (red.), 2009, *Governance – współczesne trendy zarządzania regionem*, Wyd. SWSPiZ, Łódź.
- Rzędowska A. (red.), 2017, *Elektromobilność*, Instytut Jagieloński, Warszawa.
- Schroten A., 2012, *Behavioural Climate Change Mitigation Options,* Domain Report Transport, CE Delft.
- Szoltysek J., 2011, *Kreowanie mobilności mieszkańców miast*, Wolter Kluwer Polska, Warszawa.
- Ustawa z dnia 11 stycznia 2018 r. o elektromobilności i paliwach alternatywnych, Dz.U. 2018, poz. 317.
- Ustawa z dnia 6 czerwca 2018 r. o zmianie ustawy o biokomponentach i biopaliwach ciekłych oraz niektórych innych ustaw, Druk nr 834 2018.
- Załoga E., 2013, *Trendy w transporcie lądowym Unii Europejskiej*, Wydawnictwo naukowe Uniwersytetu Szczecińskiego, Szczecin.

AKCEPTACJA SPOŁECZNA DLA IMPLEMENTACJI NOWYCH KONCEPCJI MOBILNOŚCI W POLSCE

Streszczenie: Celem artykułu jest ocena poziomu akceptacji społecznej Polaków w zakresie rozwoju nowych koncepcji mobilności sprzyjających dekarbonizacji transportu. Na podstawie przeglądu literatury przedmiotu oraz wyników badań ankietowych zaprezentowano zasadnicze uwarunkowania implementacji rozwiązań zmierzających do wypracowania nowej jakości transportu. Podkreślono, że stanowią one wypadkową badań naukowo-rozwojowych, współdziałania przedsiębiorstw, partnerstwa między zainteresowanymi instytucjami oraz

dialogu społecznego. Następnie skupiono się na potencjale elektromobilności w dążeniu do rozwoju gospodarki o obiegu zamkniętym. Dokonano oceny rynku i akceptacji społecznej dla tej koncepcji mobilności w Polsce. Zaprezentowane wyniki badań ankietowych potwierdziły wysokie zainteresowanie nowymi technologiami w motoryzacji. Jednocześnie zbyt wysoka cena EV i brak odpowiedniej infrastruktury ładowania nadal stanowią kluczowe bariery rozwoju elektromobilności w Polsce.

Słowa kluczowe: dekarbonizacja transportu, nowe koncepcje mobilności, zmiany behawioralne, elektromobilność.

Dr hab. Urszula Motowidlak
Uniwersytet Łódzki
Wydział Ekonomiczno-Socjologiczny
Katedra Logistyki
ul. Rewolucji 1905 r. nr 35/37
90-214 Łódź
e-mail: umotowidlak@onet.eu
https://orcid.org/0000-0002-2777-9451