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SUSTAINABLE DEVELOPMENT OF MICRO-SIZED ROAD TRANSPORT ENTERPRISES IN POLAND

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Abstract

Purpose. Road transport, partly due to its quantitative market share, is considered to be the area where most changes protecting the natural environment should be introduced. It is essential to direct enterprises' development towards becoming sustainable in coherence with their activities but also their impact on the environment. Aim of the article is to deepen the knowledge about challenges, barriers, threats and opportunities arising from the implementation of sustainable development in micro-sized road transport enterprises in Poland.
Methodology. The article uses several research methods and tools. Analysis of available sources made it possible to characterise the share of road transport in selected European Union countries as well as present the changes taking place through the modernisation of vehicle fleets. The functioning of transport companies was presented after conducting unstructured interviews with entities included in the study. The issue of sustainable development of micro-sized road transport enterprises in Poland was also supplemented by PESTEL analysis, which made it possible to categorise selected conditions affecting enterprises' activities.
Findings. Identification of key internal and external conditions affecting the implementation of sustainable development in micro-sized road transport enterprises. In the utilitarian aspect, obtained results can serve as guidelines in decision-making problems undertaken by micro-sized road transport enterprises. In the theoretical aspect - provide a background for further research on the subject of transport-forwarding-logistics sector enterprises' sustainable development.

Keywords: sustainable development, road transport, microenterprises, modal split, PESTEL/PESTLE analysis

JEL classification: O12, Q01, R40, R49

Introduction

Road freight transport used in local, national or international distances shares an unyielding popularity, both among customers using transport services and companies deciding to conduct their business focused on the provision of road transport services. There may be several reasons

for this state of affairs. On the supply side represented by enterprises, the relatively low market entry threshold due to the lower costs of purchasing or leasing the necessary material resources or also due to smaller quantity of needed documents compared to other modes of transport should certainly be mentioned. On the demand side, represented by transport services customers, there are arguments in the form of a relatively low cost of purchasing the service, relatively short time of the transport process, but above all the possibility of receiving the goods directly at the destination without the need for transshipment (door-to-door service), which makes among all transport branches an element characteristic only for road transport.

Despite the above-mentioned factors conducive to business development in road transport companies, they are also struggling with challenges that could be defined as a sign of modern needs - the need to make financial outlays aimed at meeting specific requirements in the context of sustainable development. Focusing on the area of Poland, among others, it is the Agenda 2030 set by the United Nations or the European Green Deal (Koralova-Nozharova, 2021) proposed by the European Union. In the case of the first project, it focuses primarily on the 17 Sustainable Development Goals (SDGs) which should be achieved by the year 2030 (Transforming our World: The 2030 Agenda for Sustainable Development, 2015). It should be noted that all types and sizes of enterprises, even micro-sized enterprises, are induced to introduce different pro-ecological changes (Zaorski-Sikora, 2023). In the case of the second project, the keynote is aimed above all at achieving climate neutrality by the year 2050 and it is assumed that for Poland and other European Union countries it creates a significant impact on their road transport development (Bekisz, Kruszyński, 2022). It can be stated that under the slogan of sustainable transport development, companies are forced to make certain changes in a veiled way, such as the modernisation of the owned or leased vehicle fleets and undertaking additional road fees. For instance, one of the proposed solutions in connection with the reduction of pollutant emissions is to invest in electric vehicles (Zhang, Fujimori, 2020). However, it should be emphasized, that not only making changes to the trucks used, but also to the ways in which they are powered, for example alternative fuels (Wątróbski, Bąkiewicz, 2022) can contribute to reducing the emissions of pollutants and thus fostering sustainable development.

According to many, on the ecological side, business entities are focusing their activities in accordance with the requirements set by ESG reporting, by which they are required to monitor activities aimed at reducing the negative impact on the external environment. The type and obligation of reporting depends primarily on the scope of the services provided and the size of the company. Initially, additional bonds were charged to public interest entities (Mućko, Niemiec, Skoczylas, 2021), but over the coming years, this scope will be extended to include entities employing more than 500 people, and even later all entities classified as small and medium-sized enterprises employing more than 10 people. In the case of micro-sized enterprises, it is also assumed that they will need to monitor their sustainable-related development, but for now there is no set date when it is going to happen.

The division of the ESG reporting obligation according to the number of employees is an interesting case because when the focus falls on the activities of micro-sized enterprises, it can be seen that they are very often (mostly due to their quantitate market share) called the most important pillar of the economy (Ungureanu, Ungureanu, 2020). Despite that, in the case of an individual approach to micro-sized entities, it is noticed that their single range of impact is small, and the lack of direct measurable benefits (for example monetary) from the implementation of sustainable development (Bielawska, 2022) means that micro-sized enterprises are reluctant to decide to undertake extracurricular pro-ecological investments.

If the focus is directed to micro-sized road transport enterprises, it can be noticed, which is confirmed by the conducted unstructured interviews, that the implementation of sustainable development is associated with necessary changes (for example, those imposed from above by cooperating entities) or those of the nature of achieving direct benefits, rather than extracurricular

decisions. The question that should be asked is what form should the continuation of sustainable development of micro-sized road transport enterprises take and how deep the implementation should reach into the activities of those entities. The main objective to help answer the question is to identify both internal conditions and external factors affecting the sustainable development of micro-sized road transport enterprises in Poland.

Moreover, the matter should be looked at also taking into account the possible scenario of decreasing popularity and importance degree of micro-sized road transport enterprises in creating the national economy impact in favour of larger enterprises - due to the recorded decline in the share of micro-sized road transport enterprises in the activities of the transport-forwarding-logistics sector in Poland (Road transport in Poland 2023 report).

1. MONITORING THE PROGRESS OF SUSTAINABLE TRANSPORT DEVELOPMENT USING MODAL SPLIT

In the introduction of various solutions aimed at the sustainable development of transport-forwarding-logistics sector companies, it is important that the results are measurable and indicate the correctness in the chosen direction of changes. In the case of sustainable development of freight transport, one of the many ways to reduce the negative effects of road transport is to modal shift its processes to other modes of transport. For years, modal shifts have been recognised as one of the most effective tools, including also for the decarbonization of ongoing transport processes (Motowidlak, 2023). The tool, used both on a national and global scale, is able to support effective transport management (Kaack, Vaishnav, Morgan, Azevedo, Rai, 2018). In addition not only to environmental aspects, it should be remembered that on the side of advantages in favour of modal shift, measurable financial benefits are indicated, for instance in the form of a limited cost of delivery (Juřík, Janoš, 2023).

In the case of replacing road freight transport, the need to intensify rail transport is most often indicated. However, expensive investments in connection with the modernisation or complete restoration of selected railway connections may prove to be a problem (Dyr, Dyr, 2019).

Therefore, the question should be asked, how individual European Union countries are coping from the perspective of the modal split tool - especially in the face of the growing requirements of the United Nations and European Union for the sustainable development of road transport.

Analysed modal split of carried out tonne-kilometres in freight transport, in the adopted research period starting in 2013 and ending in 2022, shows that in the case of 25 European Union countries, they can be divided into two groups. The first group consists of countries with at least 50% share of road freight transport in modal split and the second group consists of countries with less than 50% share of road freight transport in modal split.

The at least 50% share of road freight transport is recorded in 9 countries (Luxembourg, Czech Republic, Poland, Austria, Switzerland, Hungary, Slovenia, Slovakia and Germany) – their annual results are shown in the chart presented in Figure 1.

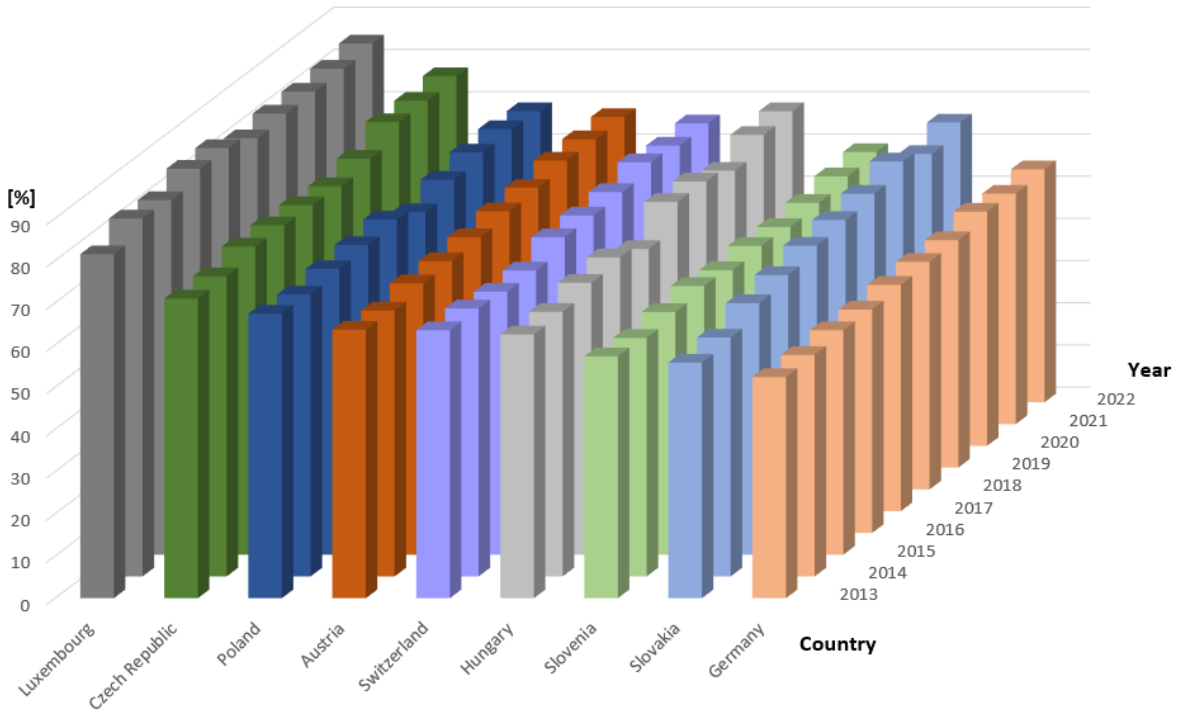

Figure 1. Selected European Union countries with over 50% share of road freight transport in accordance to carried out tonne-kilometres in 2013-2022

Source: own study based on Eurostat data.

Over the past 10 years, for the analysed 9 countries of the European Union, the modal split has decreased or increased by several percentage points year by year. Interestingly, for all the countries surveyed, the share of road freight transport is higher in 2022 than in 2013, as shown in Table 1.

Table 1. Percentage point difference in the share of road freight transport in modal split between 2022 and 2013

Country	Percentage point difference for 2022 and 2013
Slovakia	10.5
Hungary	6.5
Czech Republic	6.3
Austria	4.0
Luxembourg	3.5
Germany	2.8
Switzerland	2.6
Slovenia	2.0
Poland	1.6

Source: own study.

Comparing on the other hand the differences between the lowest and the highest values achieved in the 10 years period, the smallest difference of 2.8 percentage points between the lowest (2014) and the highest (2022) value was recorded in Slovenia. Nevertheless, the largest difference of as much as 11.6 percentage points between the lowest (2013) and the highest (2020) value was recorded in Slovakia.

In the same period (2013-2022), in 16 European Union countries (Romania, France, Finland, Lithuania, Sweden, Italy, Netherlands, Spain, Norway, Croatia, Latvia, Ireland, Estonia, Greece, Cyprus and Portugal), the share of road freight transport by tonne-kilometres was less than 50%, as shown in the chart in Figure 2.

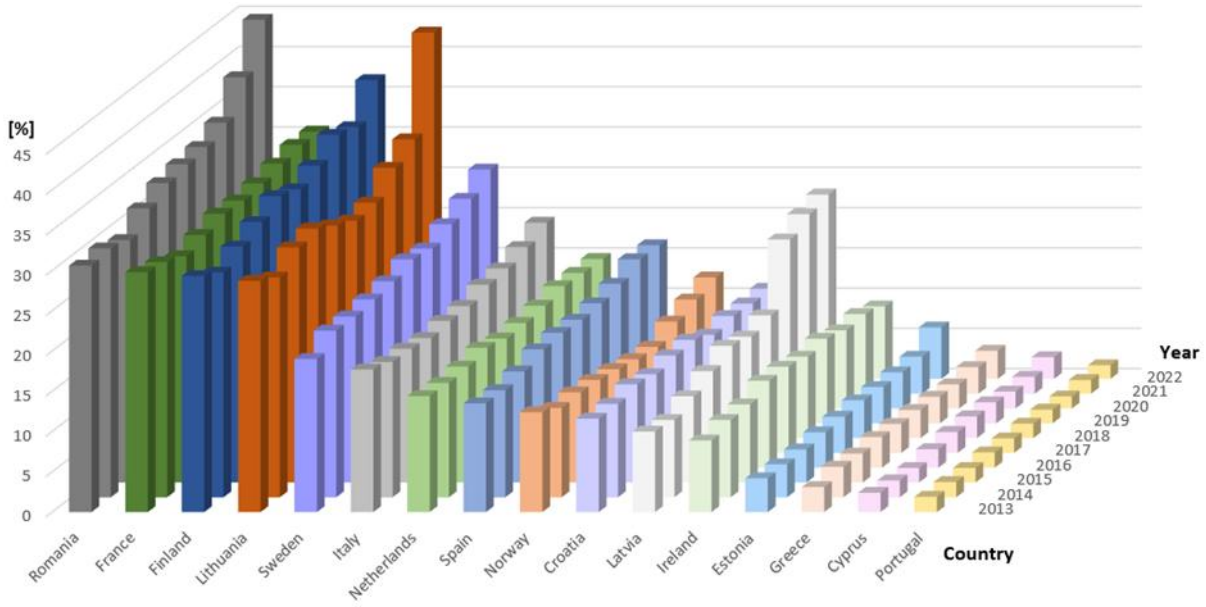

Figure 2. Selected European Union countries with less than 50% share of road freight transport in accordance to carried out tonne-kilometres in 2013-2022

Source: own study based on Eurostat data.

Interestingly, in the case of 14 out of 16 countries analysed, the share of road freight transport is higher in 2022 than in 2013, as shown in Table 2. The exceptions are Croatia with a decrease of 0.4 percentage points and Portugal with a decrease of 0.2 percentage points.

Table 2. Percentage point difference in the share of road freight transport in modal split between 2022 and 2013

Country	Percentage point difference for 2022 and 2013
Lithuania	14.3
Romania	14.0
Latvia	12.9
Finland	7.8
Sweden	7.0
Spain	3.1
Estonia	2.2
Italy	1.7
France	0.9
Netherlands	0.5
Greece	0.4
Cyprus	0.3
Norway	0.2
Ireland	0.1
Portugal	-0.2
Croatia	-0.4

Source: own study

For the 16 countries with a share of road freight transport less than 50% in the modal split, the smallest percentage point difference between the lowest value (2019) and the highest value (2013, 2014 and 2016) was recorded in Portugal at 0.4 percentage points (the share of road transport decreased). On the other hand, the largest difference between the lowest value (2018) and the highest value (2022) was noticed in Lithuania at 16.0 percentage points.

For the period from 2013 to 2022, comparing the results achieved by both countries with a share of road freight transport above and below 50% in the modal split, several important aspects are noticed. In the vast majority of cases, the modal shift did not actually occur, and in the case of as many as 23 countries, the share of road transport in 2022 was between 0.1 and 14.3 percentage points higher than in 2013. This is an interesting aspect because 2015 was the time of the introduction of the 2030 Agenda and 2019 was when the implementation of the European Green Deal project took place (shortening the research period to 2015 or 2019, the results from 2022 are still higher). It should also be mentioned that for most of the countries analysed, the amount of yearly transported goods increased every year.

It is therefore assumed that despite the attempt to reduce the share of road transport in all transport processes and additional obligations for freight road transport enterprises, it is still a vividly way used by customers for delivering their goods.

2. CHANGES IN THE TRANSPORT FLEETS OF POLISH ENTERPRISES

The sustainable development of transport-forwarding-logistics sector companies is associated with changes in several areas of their activity. Modifications undertaken by enterprises include changes in their material resources or even financing sources. For road transport companies, the sustainable development is most often associated with the need to modernise their transport fleet.

Despite many assurances that the adaptation process of pro-ecological solutions and their results bring mutual benefits (both for the company implementing the changes and the external environment) they often cause ambivalent attitudes. This is due to the fact that the adaptation of changes is often referred to as optional, but it should be remembered that the countries and communities they are part of, in various ways push for providing changes in companies' activities. In many countries it is presented as for instance road tolls, which increase with the age of the truck - it is related to the year of production and meeting the criterion of the emission standard (Jacyna, Wasiak, 2015) - or the ban on entering selected restricted areas (Ocampo-Giraldo, Gonzalez-Calderon, Posada-Henao, 2019). Another example of the pressure being put on the sustainable development of companies is the change introduced in France, where it was decided to reduce the permissible gross vehicle weight from 44 tonnes to 40 tonnes for trucks within the EURO 5 emission standard and below (Ministry of Ecological Transport Transformation 2021). It results in a situation in which companies that have so far transported the heaviest loads will be forced to replace their tractor units with newer ones or give up transporting heavier loads for lighter ones. Regardless of the steps taken, both situations can significantly affect the costs incurred or the profits achieved.

In addition to the already existing solutions conducive to sustainable development, micro-sized enterprises should also consider the tools that may be introduced in the future. These include requirements for accurate documentation of work related to servicing the transport fleet or waste management. It is believed that in advance preparation can increase the company's market competitiveness.

Focusing on Poland, the available data enables analysing how the number of tractor units divided by age changed in the years 2013-2022. The chart in Figure 3 shows the distribution of vehicles for four time ranges – less than 2 years, from 2 to 5 years, from 5 to 10 years and from 10 to 20 years - while Table 3 shows the percentage influence of the selected age range for the whole year.

The study omits vehicles over 20 years because according to the Central Statistical Office in Poland, it can be seen that in the total recognition of all registered trucks, depending on the examined year, they account for up to only several percent share and what is more important, the oldest trucks are responsible for only 1-2% of all goods transported by road per year.

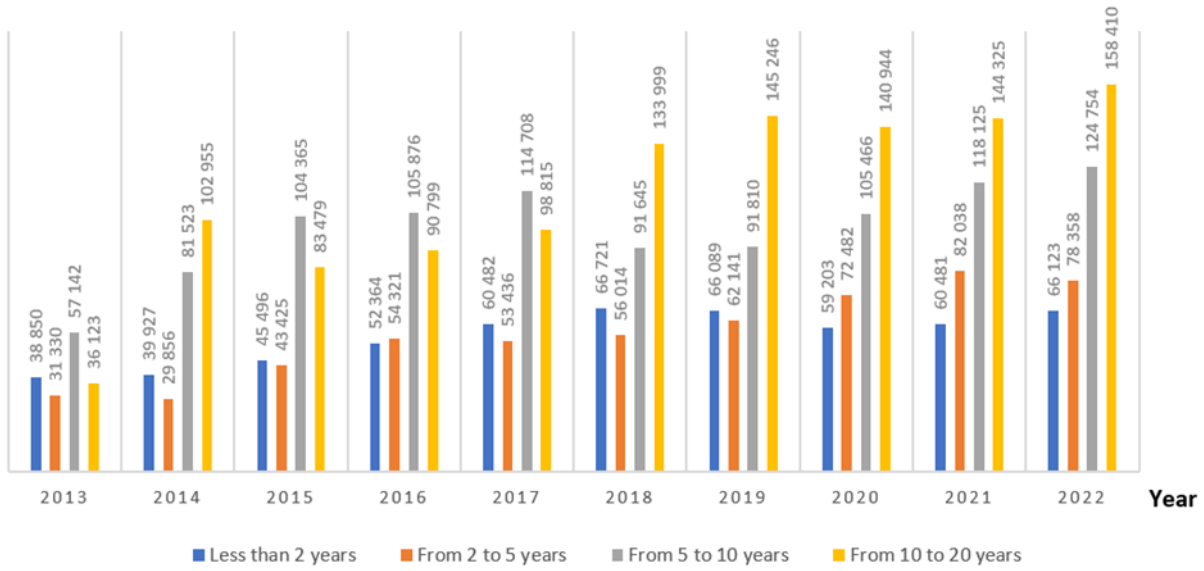

Figure 1. Age distribution of tractor units used in Poland from 2013 to 2022

Source: own study.

Table 3. Percentage share of selected age groups of tractors units in Poland from 2013 to 2022

Age group	Year									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Less than 2 years	23.77	15.70	16.44	17.26	18.47	19.15	18.09	15.66	14.93	15.46
From 2 to 5 years	19.17	11.74	15.69	17.91	16.32	16.08	17.01	19.17	20.26	18.32
From 5 to 10 years	34.96	32.06	37.71	34.90	35.03	26.31	25.13	27.89	29.17	29.17
From 10 to 20 years	22.10	40.49	30.16	29.93	30.18	38.46	39.76	37.28	35.64	37.04

Source: own study.

As it can be noted, in the case of Polish road transport companies, for the period from 2013 to 2022, the largest share among the tractor units used are those in the from 5 to 10 year old category (2013 and from 2015 to 2017) and the from 10 to 20 year old category (2014 and the period from 2018 to 2022). Regardless of the year under review, both age categories account for at least 55% of the share in all registered tractor units (for 2014 it was as much as 72.6%). This shows, according to the information taken from unstructured interviews, that Polish road transport companies are much more willing to use older vehicles than replacing them with those which are younger than 5 years.

Several factors may be responsible for this state of affairs. Unstructured interviews conducted with transport companies and publicly available sources show that newer vehicles, on the one hand, very often bring benefits in the form of lower road tolls, lower fuel consumption (Bal, Vleugel, 2018) or increased travel comfort (Specification materials from several truck manufactures, 2023-2024). On the other hand, these vehicles are much more advanced in the technological aspect, which requires access to specialised technical facilities. Interestingly, in the case of some of the problematic advanced components mentioned by the companies, there are solutions such as Selective Catalytic Reductive (SCR) responsible for reducing the emitted pollutants (Liu, Tan, 2020).

Newer tractor units users indicate that the pro-ecological solutions used in vehicles often become problematic and faulty - it contributes to a significant increase in the cost of using those vehicles. Measurable benefits in the form of lower road tolls or lower fuel consumption often do not sufficiently compensate for the losses incurred. It is also worth noting, according to the Chief Transport Inspectorate in Poland, that there are situations in which the law is being broken and some of the components responsible for the release of cleaner exhaust gases are removed or their operational purpose is often limited.

In addition, while analysing the years 2020, 2021 and 2022, one can be noticed - a decrease in the share of vehicles newer than two years by several percentage points compared to previous years, which was probably caused by the outbreak of the COVID-19 pandemic and its consequences. A significant increase in the disruption of global supply chains for the automotive industry (Pató, Herczeg, 2020) reduced the availability of new tractor units and prices have increased depending on the brand to as much as 20-30% compared to the pre-pandemic period.

3. PESTEL/PESTLE ANALYSIS IN THE SUSTAINABLE DEVELOPMENT OF MICRO-SIZED ROAD TRANSPORT ENTERPRISES

The drivers to encourage or discourage the implementation of sustainability in micro-sized road transport enterprises can take many forms. The possibility of dividing into internal factors dependent on the company's conditionals and external factors of influence is noticed.

According to the companies' information already presented, internal factors result primarily from the company's experience, knowledge, material resources and cooperations. In the case of micro-sized enterprises, the vast majority of changes count if their effects can be noticed in a short period of time, e.g. lower operational cost, lower fuel consumption, lower maintenance costs or road fees.

The external factors on the other hand can be categorised according to 6 groups: political, economic, social, technological, environmental and legal. In order to clearly present the most important external factors affecting the implementation of sustainable development, an extended PEST analysis – PESTEL/PESTLE – is used. The results of the analysis presenting the division of selected impact aspects into 6 main categories are shown in Table 4.

Table 4. PESTEL analysis of the implementation of sustainable development in micro-sized road transport enterprises

Political factors:	**Economic factors:**
– compliance with national and international transport policies, – adaptation to sustainable development programs, – investments in sustainable infrastructures, – dependence on promoted transport policies.	– reducing fuel and road costs, – improved energy efficiency, – lower operating costs, – lower insurance costs, – possibility of using selected subsidies, – higher costs of advanced technological maintenance, – enhancing company's market competitiveness by in advance implementation of sustainable solutions.
Social factors:	**Technological factors:**
– improvement of company's image, – promotion of environmental awareness, – consumers' preferences, – improvement of work safety, – development of Customer Social Responsibility.	– use of alternative fuel, – automation of processes, – digitalisation of processes, – dependence on advanced technology.
Environmental factors:	**Legal factors:**
– reduction of harmful emissions, – use of renewable sources, – reduction of emitted noise, – increase in environmental awareness, – increase in energy efficiency.	– preparation for future certification i.e. vehicle licensing, – compliance of legal regulations.

Source: own study.

Based on the PESTEL/PESTLE analysis, the sustainable development of micro-sized road transport enterprises entails a number of both positive and negative factors that can affect the activities of those entities in various ways. Depending on the size of a given micro-sized enterprise, its resources, the scope of its impact, the services offered and the stabilisation of operations, selected factors may take on different weights of incentives supporting or limiting development in the perspective of becoming a sustainable entity. Some of the factors' effects are postponed in time, because their results are not valid yet since micro-sized enterprises are not obligated to remain sustainable in every way of their activities.

Merging the internal conditions of the company with the external factors interacting from enterprise's environment will allow to individually select the appropriate steps and actions which should be taken towards becoming a sustainable entity.

Conclusions

The issue of sustainable development of micro-sized road transport enterprises in Poland gives a very wide field for discussion. The article was aimed at bringing selected issues closer and exploring different perspectives on the topic discussed.

Some believe that road transport should account for the smallest possible share in all transport processes, but as the modal split analysis of selected European Union countries showed, for the years 2013-2022, road freight transport enjoyed unyielding popularity in most cases. For many of the countries cited above, the number of all goods transported by different modes of transport is increasing year by year and the share of road transport in the entire ranking did not decreased. In most cases the results obtained for 2022 are higher than at the beginning of the analysed period. Therefore, it can be assumed that in the next few years the situation will not deteriorate enough to completely abandon business activity aimed at providing road transport services, which may be a concern for companies already existing on the market and those who are considering entering it.

However, a new problem may seem to be the decline in the share of micro-sized enterprises in the road transport market in favour of larger entities (especially medium and large companies). This can be seen, for example, when comparing the results from 2009 and 2021, when in 2009 micro-sized road transport enterprises accounted for about 51% of revenues generated by road transport, and in 2021 their share decreased to 33%. The situation is similar in the case of employment, where in 2009 micro-sized enterprises accounted for 65% of employment, and in 2021 this result was only 42% (Road transport in Poland 2023 report).

In the case of micro-sized road transport enterprises, sustainability is often associated with the need to modernise the transport fleet. When examining the tractor units used in Polish road transport over the years 2013-2022, it is noted that entities are much more likely to use vehicles aged from 10 to 20 years or from 5 to 10 years rather than vehicles aged from 2 to 5 years or less than 2 years. Interestingly, since 2018, the share of the latest tractor units has been decreasing year by year. In the case of 2020, 2021 and 2022, the declines can be argued by a decrease in the availability of new vehicles due to the disruptions in automotive supply chains caused by the COVID-19 pandemic. But overall, which is confirmed by unstructured interviews, transport companies are reluctant to purchase the latest vehicles due to too low benefits from their use in relation to the size of the investment made or the degree of technological advancement (which besides some benefits can also cause additional problems).

With the use of information obtained from unstructured interviews and publicly available materials, exploring the subject of sustainable development of micro-sized road transport enterprises, it is noted that the pace and path of the chosen changes depends on internal factors (tangible and intangible resources) and external factors (enterprises' closest and furthest environment).

In the case of internal dependencies determining the way sustainable solutions are implemented, a certain recurrence is noticed in concerns related to the reorganization of a micro-sized enterprise. Decisions on significant investments in order to modernise the company often need to be made. While the recurring arguments beneficial for companies were to improve safety, cut fuel costs, reduce road tolls or speed up selected operations, it is also pointed out that the technological advancement of the newly used solutions is much higher, which does not always go hand in hand with their maintenance-free nature. A situation arises in which a significant investment for a micro-sized entity is considered, which does not give satisfactory results – the scale of impact may be too small. However, it also depends on the experience and knowledge of the company, as well as the financial situation and the cooperations undertaken. Micro-sized road transport enterprises are much more often focused on obtaining direct benefits from the investments made (in this case, sustainable solutions), while regardless of the path taken, entities

should remember about indirect benefits, the effects of which are usually delayed in time. On the other hand, in advance preparation could cause an increase in company's market competitiveness.

The degrees of importance of the selected category shown in PESTEL/PESTLE analysis and its individual factors are assumed to depend on the internal conditions of the company. Also, depending on the internal conditions some of the external factors can cause both positive or negative effect. Only by merging internal and external values, micro-sized road transport enterprises can choose the right path towards becoming sustainable.

Obtained results can serve as guidelines in improving a sustainable based micro-sized road transport company or even in some decision-making problems. The article could be also used as a background for more advanced and extended research on sustainable development of the transport-forwarding-logistics sector in Poland.

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ZRÓWNOWAŻONY ROZWÓJ MIKROPRZEDSIĘBIORSTW TRANSPORTU DROGOWEGO W POLSCE

Patryk Heliosz

Streszczenie

Cel. Transport drogowy, między innymi ze względu na swój ilościowy udział rynkowy, jest uznawany za obszar, w którym należy wprowadzić najwięcej zmian ochraniających środowisko naturalne. Konieczne wydaje się ukierunkowanie przedsiębiorstw na bycie zrównoważonymi, w spójności z prowadzoną działalnością, ale także otoczeniem zewnętrznym. Celem artykułu jest pogłębienie wiedzy na temat wyzwań, barier, zagrożeń i szans wynikających z wdrażania zrównoważonego rozwoju mikroprzedsiębiorstw transportu drogowego w Polsce.

Metoda. W artykule wykorzystano kilka metod i narzędzi badawczych. Analiza dostępnych źródeł pozwoliła scharakteryzować udział transportu drogowego w wybranych krajach Unii Europejskiej oraz przedstawić zmiany zachodzące w modernizacji taborów samochodowych. Przeprowadzone wywiady niestrukturyzowane z podmiotami wpisującymi się w ramy badania dostarczyły informacji na temat funkcjonowania przedsiębiorstw transportowych. Problematyka zrównoważonego rozwoju mikroprzedsiębiorstw transportu drogowego w Polsce została uzupełniona również o analizę PESTEL, która umożliwiła kategoryzację wybranych uwarunkowań wpływających na działalność przedsiębiorstw.

Wyniki. Identyfikacja kluczowych uwarunkowań wewnętrznych i zewnętrznych wpływających na wdrażanie zrównoważonego rozwoju w mikroprzedsiębiorstwach transportu drogowego. W aspekcie utylitarnym uzyskane wyniki mogą stanowić wsparcie w podejmowaniu decyzji przez mikroprzedsiębiorstwa transportu drogowego. W aspekcie teoretycznym – stanowić podstawę do dalszych badań nad zrównoważonym rozwojem przedsiębiorstw sektora transportu-spedycji-logistyki.

Słowa kluczowe: zrównoważony rozwój, drogowy transport samochodowy, mikroprzedsiębiorstwa, modal split, analiza PESTEL/PESTLE

Klasyfikacja JEL: O12, Q01, R40, R49

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