EMBA Automotive Industry

ACADEMY FOR CONTINUING EDUCATION

Development of a Guideline for the road transport industry in Poland in the context of changes in the future

A Master's Thesis submitted for the degree of
“Executive Master of Business Administration”

supervised by
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Vienna, 06.10.2023

Affidavit

I, **MAG.PIOTR BOGDANSKI**, hereby declare

1. that I am the sole author of the present Master's Thesis, "DEVELOPMENT OF A GUIDELINE FOR THE ROAD TRANSPORT INDUSTRY IN POLAND IN THE CONTEXT OF CHANGES IN THE FUTURE", 115 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 06.10.2023

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Signature

Acknowledgement

Special thanks go to my family and the management of my employer *SAF Holland GmbH,* for all the support and helpful time given. I would like to express my sincere gratitude to my supervisor, *Prof. Dr.techn. Dipl.-Ing. Daniel Palm* for their invaluable guidance and support throughout my master's program. Their expertise and encouragement helped me to complete this research and write this thesis.

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Abstract

This work analyses the current situation of the transport industry in Poland and presents the prospects for small and medium-sized enterprises in the context of changes. It shows the mega trends and risks in the next 5 years. The transport industry is one of the most important in the Polish economy and the position of Polish companies is key in Europe. These companies from Poland are currently facing with strong competition that aspires to become a leader. This work also shows the historical background of the transport industry in Poland. The aim of this work is to identify future changes in the transport business in areas such as legal, technological, social or competitive performance. The transport industry in Poland will also be influenced by global trends such as autonomous vehicles, eco driving, telematics, freight digitization and electrification. This paper also shows how significant the use of drones by transport companies can be. Poland's geographic location helps in the development of logistics centers, which are important investments.

The transport industry is under high cost pressure. This is especially related to changes in law and regulations implemented by the European Union in relation to fleets. The challenge for the companies is to develop the company into an attractive future-oriented company which is also attractive for employees. This paper shows how Polish companies are prepared and what is their knowledge about the changes that dynamically take place in the transport industry. This work presents the results of a survey conducted among experts in the transport industry in Poland, which answer the research questions. The questions touched on the areas of human resources, mega trends, new technologies, risk assessment and threats for professionals in the transport industry. This work also indicates competition that directly affects the position of Polish transport companies in Europe. The guideline will help practitioners and decision makers such as owners, managers or politicians to evaluate the impact of future changes to their business. The study shows how to extract the necessary fields of action and recommendations for Polish transport companies. This work presents not only recommendations but probable scenarios for transport companies in the near future in Poland. The final part of this work indicates the degree of preparation of the entire transport industry for the upcoming changes.

Abbreviations

5G - 5th generation mobile network

AG- Aktiengesellschaft

AGV - Automated Guided Vehicle

AR - Augmented reality

CAWI - Computer Assisted Web Interviewing

CEO - Chief Executive Officer

CEP - Courier, Express and Parcel

CIT - corporate income tax

CNG - Compressed natural gas

CO2 - carbon dioxide

e.g - exempli gratia

ERP - enterprise resource planning

EU - The European Union

EUR - the official currency of the European Union

Eurostat - the statistical office of the European Union

FTL - Full truckload

GDP – gross domestic product

GPS - The Global Positioning System

GIRT- General Inspectorate of Road Transport in Poland

GVW - gross vehicle weight

HR - Human Resources

i.e – id est

IT- information technology

km- kilometer

kW – kilowatts

LHV- Longer Heavier Vehicles

LNG - liquefied natural gas

LTL - Less than truckload

MAN - Maschinenfabrik Augsburg-Nürnberg AG

PIT - employee income tax

PPC- The Predictive Powertrain Control

SAF- Sauer Achsenfabrik GmbH

TMS - Transportation Management System

TSL - Transport, shipping and logistics sector

UAS- Unmanned Aerial Systems

UAV- Unmanned Aerial Vehicle

UPC - United Parcel Service, Inc.

USA - United States of America

USD - the official currency of the United States of America

VAT - value added tax

VR - Virtual reality

WMS - Warehouse Management System

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1. Introduction: Facts and Circumstances

The world economy has become more integrated over the past thirty years. Countries are doing their socio-economic strategy, and they are becoming more and more dependent. The Covid-19 pandemic in 2020 delayed this process significantly. This threatened the traditional role of transport by disrupting the flow of goods and breaking supply chains. Transport is an important element of the global economy and an initial factor for many processes. The economic development of the country often depends on the condition of the transport industry. Along with the changes taking place in the economy, the conditions of transport are also constantly evolving. Transport performs certain specific functions in the national economy, which we can indicate as:

- element of the exchange of goods and services within the framework of trade in goods
- affects the growth of GDP in the country
- affects the development of infrastructure
- it performs social tasks and influences the development of culture, education and sport [1]

Logistics is also important in transport. According to the definition of the Council of Logistics Management, logistics is "the process of planning, implementing and controlling the efficient and economically efficient flow of raw materials, finished goods and relevant information from the point of origin to the point of consumption, in order to meet customer requirements".[2] Therefore, logistics is about transfer of goods (transport) and time (storage) using a physical and organizational infrastructure network. The transport market is currently undergoing many changes that were not visible before. Transport is one of the most important sectors of the economies of the EU Member States. The efficient functioning of the transport industry affects the benefits of the internal market of the European Union.

"Road transport has the highest share of freight transport in the European Union. In 2018 the volume of goods transport, measured by transport performance in EU countries, amounted to 1924.4 billion tkm and was by 0.6% higher than in 2017.

[1] Grzywacz W, Burnewicz J. (1989): „*Ekonomika transportu" [Transport economics*], Warsaw, p. 43-44

[2] Coyle J.J, Bardi E.J, Langrey J.C. (2022): „ *The Management of Business Logistics, Sixth Edition",* Warsaw, p.51-52

Germany was the leader in terms of transport performance (316.8 billion tkm), Poland ranked second (315.9 billion tkm), followed by Spain (239.0 billion tkm)"[3]. Pipeline transport in Poland is only 2.5% of all transport, and rail transport is 11.4%. The largest share based on one tonne falls on road transport and amounts to 85.5%. Road transport constitutes the largest share of all road transport in Poland.[4] In 2020, the road transport market in Poland was worth around 45 billion Euro. Production and the supply chain require an efficient element that is the transport and delivery of goods. It can be estimated that transport is of critical significance in generating 50 percent of the Polish GDP.[5]

Every action should be based on facts. Such knowledge helps in planning and implementing strategies in companies. Decisions of managers based on facts effectively and optimally help in effective management.

"In Poland, there are about 125 thousand companies engaged in road transport of commodities - that is, 6.6 % in relation to all enterprises registered in the country. A great majority of these are one-man businesses. However, the number of medium-sized and large enterprises is growing most dynamically".[6] 693,000 people were employed in the transport industry in Poland in 2021 and it was 4,4% more than in the previous year. These people found employment mainly in the private sector.[7]

"Demand for work is growing faster than supply of employees. As a result, the development conditions are becoming increasingly difficult. Among all employees of the sector, drivers constitute around half a million. One third of them is approaching retirement age soon, which is a higher percentage compared to other sectors".[8]

Demographic trends mean that population aging will be an important factor in the near future. The young generation will have to replace experienced workers who are retiring. The transport industry offers specific employment conditions, a big challenge

[3] Dmitrowicz-Zycka K. (2021): *"Road Transport in Poland in the years 2018 and 2019",* Statistical Office, Szczecin and Warsaw

[4] Stat.gov.pl „*Transport - activity results in 2018"*(2018) *:* https://stat.gov.pl/en/topics/transport-and-communications/transport/transport-activity-results-in-2018,6,14.html [retrieved on January 15, 2023]

[5] Morawski I., Defratyka I, Laszkowski J, Kalisiak A. (2022) „*Road transport in Poland 2021+": https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/* [retrieved on January 15, 2023] , p.4

[6] Ibidem [retrieved on January 15, 2023] p.4

[7] Sas A. (2022) : https://www.statista.com/statistics/1118189/poland-average-employment-in-transport/#statisticContainer [retrieved on January 15, 2023]

[8] Morawski I., Defratyka I, Laszkowski J, Kalisiak A. (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 15, 2023] , p.4

will be to attract young employees and then properly introduce them to this sector. Despite the pessimistic economic scenarios, even the path of further development of the transport industry is envisaged.

Transport comes in different types and is not a classic service.. All transportation modes require high capital investment and being as a capital intensive sector.[9] The truck fleet is getting younger. In the last ten years, the number of loads transported by vehicles up to five years old has increased significantly. In recent years, the Polish transport industry has also been undergoing a period of increased investment in equipment and facilities.

The current time is a constant change for the road transport industry as a result of EU and national legislation and technological advances. The dynamically changing geopolitical situation has a direct impact on the road transport industries in Poland.

According to the latest statistics of the European Statistical Office (Eurostat) and SpotData, polish transport companies are leaders in the entire European Union and the transport industry is one of the most important branches in the Polish economy. One of the elements important for the development of transport is geographical location. Poland is located in the European Union and has access to its eastern border. It has access to the sea and is the most important European transit routes to intersect. For many years, Poland has witnessed a rise in investment in developing road. Legislative changes in Poland, but also in the EU - the Mobility Package, have a huge impact on the condition of Polish transport companies. Competition may also come from other countries from outside the European Union, such as Serbia, Macedonia or Bosnia and Herzegovina.

„Mobility Package, it is expected that introducing in 2022 Mobility Package in entire EU will increase labour costs by apx 30% - increase will be related to additional taxes, retirement and social benefits to be charges for full driver's salary".

[9] Christidis P., Navajas E., Brons M., Schade B., Mongeli I., Soria A. (2014): *„ Future employment in transport",* European Commission Joint Research Centre Institute for Prospective Technological Studies, Luxemburg, p.9-11

"Driver costs represent 35% in cost structure of transportation companies and after Mobility Package will be life in 2022 it is estimated it will increase to 45-50%".[10]

1.1 Motivation

The author of this work has been working in the automotive industry for 18 years, and it is very important to contribute and support the transport industry in Poland with this work. He currently works as for worldwide commercial vehicle component supplier. The transport industry is currently undergoing many changes. The changing business environment through electrification, cost reduction and the new solutions are experiences that it will be present in this analysis.

The guideline will help practitioners and decision makers to evaluate the impact of future changes to their business. In a changing environment, transport companies have the challenge how to evaluate on future changes in technology, in legal issues and market competition. This leads to uncertainty about how to react strategically and probably to losing their position in the market. Small and medium-sized transport companies have limited financial resources and need practical support and guidance on how to adapt their strategy to the business environment.

During his professional work, he constantly meets with decision-makers in the transport industry. The author noted that many companies are concerned about the future. In discussions, the customers often ask how the professionals see the coming 10 years for the transport industry.

Such conversations motivate the author even more to prepare a professional analysis of the problem and answer relevant key questions. A particularly important element of every business is proper analysis, drawing conclusions and planning. It is interesting that the transport industry in Poland is influenced by many dynamically changing factors.

This work will allow all stakeholders of the freight road transport sector in Poland to make more effective business decisions. The author of this work associate further

[10]Maersk.com *„Poland transportation market outlook for 2022"* (2021): https://www.maersk.com/~/media_sc9/maersk/news/advisories/files/2021/12/poland-transportation-market-outlook-for-2022.pdf [retrieved on January 15, 2023]

professional future with the automotive industry, especially commercial vehicles. All this motivates more to conduct a professional analysis of this sector.

This work will be combining various sources, systematizing the available information and pointing out the problems.

1.2 The research topic

Currently, there is no scientific research on the condition of the transport industry in Poland. It should provide transparency for companies on how future changes will affect their businesses, and give them guidelines to support the prioritization of actions.

The task for companies is to transform the company into an attractive, future-proof company, also attractive to employees. This work will research how transport companies in Poland are open to new technologies and flexible to a changing environment. The transport industry in Poland will also be influenced by global trends such as eco driving, telematics, freight digitization and electrification. I believe that companies have limited development opportunities because they do not know which way should to go.

The aim of this work is to identify future changes in the transport business in areas such as legal, technological, social or competitive performance.

1.3 Research questions

The aim of this work is to identify future changes in the transport business in areas such as legal, technological, social or competitive performance.

The planned methodological approach and planned procedure is empirical research and academic literature. The author is going to conduct a study in the transport industry in Poland on the current state and awareness of the impact of future changes now and in the near future - in the context of 5 years, and to extract the necessary fields of action and recommendations for Polish transport companies.

The main research question is:

- *How can road transport companies in Poland prepare to the upcoming challenges?*

In order to answer the main research question, the following sub-questions should be answered:

- *What is the knowledge of road transport companies concerning key trends in the road transport industry?*
- *What is the degree of action coping with these challenges?*

This work describes the activities of transport companies, business relations and the position of the transport industry in the Polish economy. The expected result of the study and answers to these questions is the preparation of a guideline that will support decision-makers such as managers of transport companies, politicians or institutions related to the transport industry.

1.4 Methodical Framework

As for its methodology, the theoretical part of this paper is based on studies and documents elaborated by polish and international institutions. These include annual reports, transport volumes, registration volumes, various statistics and registration figures. The calculations are based on information and reports published by public institutions. Informal qualitative approaches as interview with experts in this field. Formal quantitative research through survey about transport industry. The opinion of the experts were asked about the questions related to the research questions. All these methods will allow for a improved understanding and description of the problem.

"A *questionnaire* is a research instrument consisting of a series of questions for the purpose of gathering information from respondents. Questionnaires can be thought of as a kind of written interview. They can be carried out face to face, by telephone, computer or post".[11] Questionnaires standardize data collection. Every respondent is asked the same question. The questionnaire is economical and simply fast and process of collecting the required data can be made in a more efficient way. Surveys are professionals questionnaires on business activity characteristics. This will allow getting even better insights into the current situation of business.

1.5 Structure of the thesis

The master's thesis is divided into two parts: theoretical and practical. The theoretical part of this thesis is a thorough, synthetic and documented presentation of the theory of the analysed topic. It is prepared on the basis of specialist literature and expert opinions. This work also includes a practical part, i.e. a questionnaire and analysis of the results.

Chapter 1 gives an introduction about transport industry in Poland and the possible challenges in the near future. In the following parts of this chapter, the research problem and the methods of its analysis are described. Chapter 2 shows innovations and trends in the transport industry. It shows what types of technologies are seen in the transportation industry today. Chapter 3 presents a full picture of the transport

[11] Mcleod S. (2023): „*Questionnaire: Definition, Examples, Design And Types*" https://www.simplypsychology.org/questionnaires.html [retrieved on January 15, 2023]

industry in Poland. At the beginning, a historical outline and then the position of the transport industry in the Polish economy and in the EU. Another important point of this chapter are the changes that are currently taking place in this sector.

The last part of this chapter presents changes and trends in the transport industry in Poland. The theoretical part ends here. From chapter 4, the practical part begins, i.e. a survey and research among industry experts. Chapter 5 is an analysis of the survey results. In Chapter 6 a guideline for decision-makers is developed to prepare for upcoming changes in the transport industry. Chapter 7 draws conclusions from the findings of the thesis and gives an outlook.

2. Technology in transportation industry

The author of this work presents in the following chapters the most important mega trends that will be crucial in the near future for the transport industry in Poland. They are mainly connected to trucks, trailers and driving assistance systems and goods storage.[12]

In accordance with the standards and long-term strategy of the EU, and in particular achieving climate neutrality by 2050, the transport industry requires radical changes. The transport industry faces many challenges related to the increase in demand for services. One of the possibilities to achieve the goals is to develop and implement new solutions. These changes are to contribute to increasing the economic, financial, technological and technical efficiency. It must also be combined with a reduction in the impact on the natural environment. All these innovations are aimed at creating a sustainable development of transport. It can be said that three areas are related here: society, economy and environment.[13]

„Economic globalization refers to the increasing interdependence of world economies as a result of the growing scale of cross-border trade of commodities and services, flow of international capital and wide and rapid spread of technologies".[14] These processes lead to the unification of markets. Thanks to globalization, we have access to global markets.(see Fig.1.)

[12] Transport of the future (2022), *"Report on prospects for the development of road transport in Poland in 2020-2030",* prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 19, 2023]

[13] Consilium.europoa.eu *"Clean and sustainable mobility"* (2022): https://www.consilium.europa.eu/en/policies/clean-and-sustainable-mobility/ [retrieved on January 16, 2023]

[14] Shangquan G. (2000), „*Economic Globalization: Trends, Risks and Risk Prevention",* United Nations - Department of Economic and Social Affairs

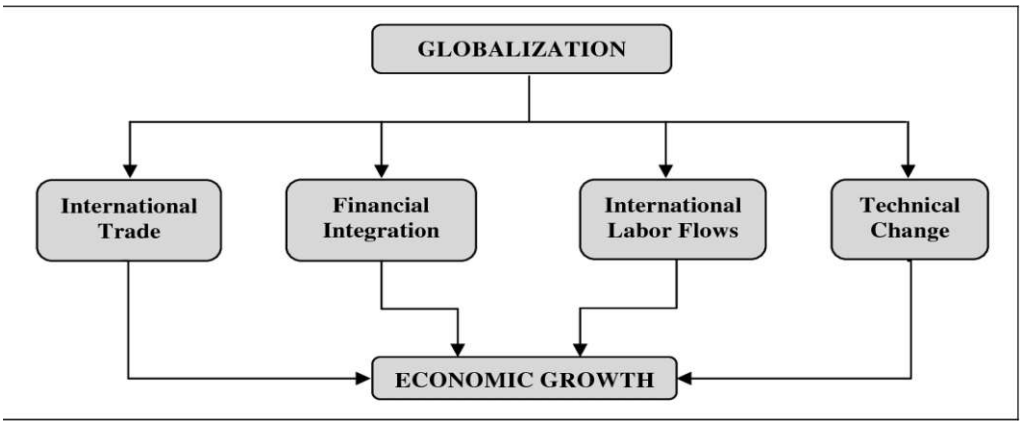

Fig. 1. *Relation between globalization and economic growth*, Source:(https://www.semanticscholar.org/paper/Effects-of-Globalization-on-Economic-Growth%3A-Panel-Kilic/0c6b237b43d9299c75a3b0596ad13c78688f7696)

Nobel laureate Joseph E. Stiglitz said that "globalization is in fact a closer integration of countries and people in the world, caused by a huge reduction in the costs of transport and telecommunications and the abolition of artificial barriers to the flow of goods, services, knowledge capital and people from country to country".[15] Globalization is also connected with the process of increasing the mobility of society. Transport is one of the factors affecting this mobility.[16] Thanks to faster means of transport, the distance between people is shortened, the so-called space-time compression occurs. In transport companies, the situation changes very dynamically every day. Extensive fleets, complex logistics processes and quick decisions require the use of appropriate tools.[17]

Globalization affects the development of logistics networks in which transport plays an important role and the result is the value of the product. Network connections also increase the requirements for logistics operators in terms of process management. IT systems are being unified, and intelligent transport chains are being built, which in turn leads to the digitization of transport and logistics.[18]

[15] Stiglitz J.E.(2004): „ *Globalization",* WN PWN, Warsaw, p.26

[16] Oecd.org „*Globalisation, Transport and the Environment"*: https://www.oecd.org/greengrowth/greening-transport/45095528.pdf [retrieved on January 18, 2023]
[17] Kozlak A. (2008): „*Transport as a factor and subject of globalization"* : https://www.logistickymonitor.sk/images/prispevky/kozlak-aleksandra.pdf [retrieved on January 19, 2023]
[18] Kozlak A. (2008): *„ Transport as a factor and subject of globalization"* : https://www.logistickymonitor.sk/images/prispevky/kozlak-aleksandra.pdf [retrieved on January 19, 2023]

All this affects:

- Improved transport management
- Reduction of storage costs
- Reduction of CO2 emissions
- Optimization of transport service selection processes
- Improving the safety of the transport of goods [19]

Generally, the process of globalization cannot be stopped. Ensuring comprehensive flows of goods requires high efficiency of various transport sectors. The integration of these elements is crucial from the point of view of the transport user who expects flexibility, reliability and information flow. However, for the service provider, i.e. in this case a transport company, it is important to be competitive, modern and create demand. The Polish transport sector is going through a period of intense investments, which may last for many years to come, due to high demand for new technologies. As a result, the heavy goods vehicle fleet is getting younger.[20]

The changing technologies make it possible to reduce costs of fuel consumption, so investments in new equipment have a significant cost saving aspect. The customers demand higher and higher environmental standards from transport service providers.

Currently, transport is under increasing economic and social pressure. Due to the progress in commercial freedom, the biggest challenge was the cost of trade and transport.

The road transport industry is facing processes of change caused by new technologies, alternative drives and digitization. Transportation technology encompasses the tools, improvements and methods that move goods across the globe.

[19] Wojewodzka-Krol K., Zaloga E. (2022), *„ Transport. Change trends“,* PWN, Warsaw, p.16
[20] Transport of the future (2022), *“Report on prospects for the development of road transport in Poland in 2020-2030”,* prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 19, 2023]

In the transport industry, innovation is the result of three things: efficiency, ease and safety. Experts from the transport industry work together to make new technologies contribute to faster and safer transport of goods.[21]

„Although the pandemic presented new challenges for the transportation industry, it also created new opportunities for innovation. In turn, we've seen significant progress in upgrading vehicles, enhancing transit accessibility, creating better rider experiences and even reducing emissions — and technology is at the core of all these improvements"[22]. New technologies such as autonomous vehicles, telematics or alternative fuels are to support the development of transport.

2.1 The digitalization of transport and logistics

The trend in the transport industry that transport companies currently see are decreasing margins and increasing costs. The digitization of the transport sector will continue to develop over the next decade. This will increase revenues and improve the quality of transport services. Digitization is no longer just administration, internal processes or accounting. Digitization allows you to enter the zone of new business processes, such as:

- concluding contracts with customers online
- physical inspection of goods
- online clearance of goods

„Transport companies are using digitalization to boost revenues, to simplify processes, to reshape their services, products and business models, and to reduce the impact of skills shortages "[23]. The integration of ERP and WMS systems helps in managing

[21] Daley S. (2022): *„Transportation Technology: Definition & Examples"* https://builtin.com/transportation-tech [retrieved on January 18, 2023]
[22] Forbes.com (2021) *"Five Ways Technology Will Change Transportation In 2022"* : https://www.forbes.com/sites/forbestechcouncil/2021/12/22/five-ways-technology-will-change-transportation-in-2022/ [retrieved on January 18, 2023]
[23] Transport of the future (2022): *"Report on prospects for the development of road transport in Poland in 2020-2030*", prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 18, 2023]

deliveries, managing vehicles and document flow. Slowly, such activities are becoming a standard in the transport industry. For managers of transport companies, the most important technologies include ERP systems supporting administration and fleet management (TMS). (see Fig.2.)

Old and current approaches to digitalization of enterprises

Fig.2 *Old and current approaches to digitalization of enterprises* Source: PwC analysis, https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 18, 2023]

Digital giants such as Amazon, for example, are also developing their platforms to handle logistics processes. In 2018, Amazon stopped using third-party logistics operators in favour of developing its own. Other such large sales intermediary portals may follow this way, causing an outflow of turnover from external operators, but it creates further opportunities for smaller transport companies that will cooperate with such digital giants.

Some companies have gained their competitive advantage thanks to digitization.[24] Digitization will continue, and current solutions will be improved based on digitization technologies.

[24] Transport of the future (2022): "*Report on prospects for the development of road transport in Poland in 2020-2030"*, prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw

Thanks to 5G broadband technology, transport companies have the opportunity to host their own mobile network. The advantage of this solution over a Wi-Fi network is to amplify the signal to increase reliability, improve speed and connect devices that are both stationary and transit. Thanks to this technology, we can determine routes and monitor the movement of vehicles inside large logistics centres. The best example can be seaports where there is a lot of traffic of vehicles and containers, but they have no contact with the outside world.[25]

Digital platforms enabling a quick connection between the shipper and the carrier are developing more and more. We call it digital freight marketplace. Shippers advertise their loads, which carriers can find using platforms, and bid for those loads directly on the market, often in real time. The freight forwarder displaces the corresponding offer and orders the transport. (see Fig.3.)

Digital freight markets also provide other features such as online tracking and payment management. This process is already very fast and well suited to the needs of both parties.[26]

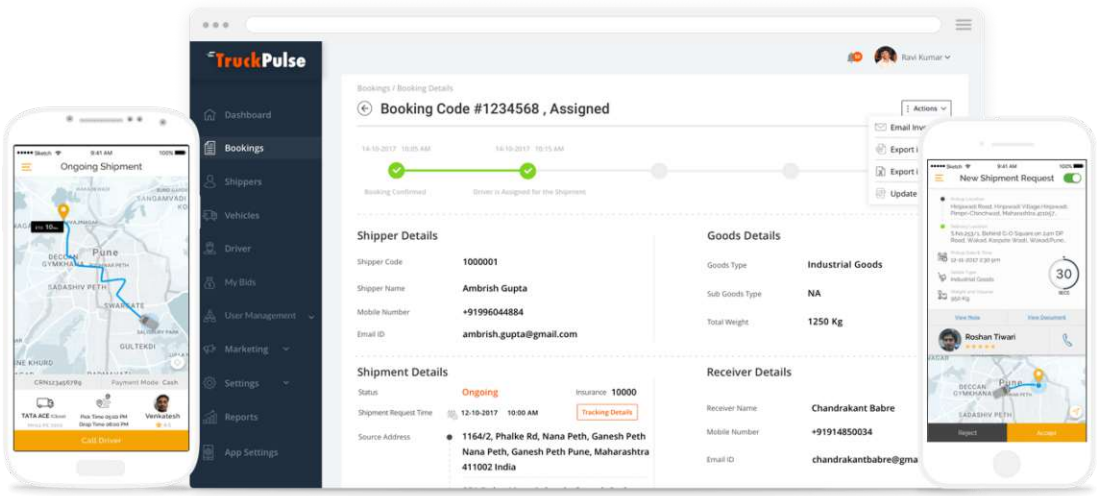

Fig.3 *Freight Bidding Marketplace Software* Source: https://mobisoftinfotech.com/products/freight-bidding-marketplace-software-solution [retrieved on January 18, 2023]

https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 18, 2023]

[25]Krug K. (2021): *„7 Transportation & Logistics Technology Trends to Watch"* https://www.supplychain247.com/article/7_transportation_logistics_technology_trends_to_watch [retrieved on January 18, 2023]

[26] Owczarek D. (2022): *„Automating Digital Freight Matching with Machine Learning"* https://nexocode.com/blog/posts/digital-freight-matching-personalized-load-to-carrier-recommendations/ [retrieved on January 18, 2023]

2.2 New fuels

The vehicles will be subject to major changes. Here, attention should be on the development of alternative drives. In this area, the key objective is the introduction of new fuels and propulsion systems that have reduced CO2 emissions. It is also important to reduce Europe's dependence on fuels. It should be remembered here that this also involves the development of the infrastructure for servicing such vehicles in the future. The overarching goal of these changes is to ensure high mobility, efficiency and environmental protection.

The European Commission has adopted an action plan „white paper“ with 40 concrete initiatives for the next decade to build a competitive transport system that will boost mobility. Europe reduces dependence on imported oil and transport carbon emissions by 60% in the next 25 years.[27]

In the field of new fuels, two paths are being analysed. The first is the development of electric trucks. The biggest challenge here, however, is the weight of the battery and the need for frequent charging. This will be a particular disadvantage for vehicles carrying out long-distance international transport. According to experts, widespread use of this type of vehicle is not possible. For this reason, hydrogen-based technologies are being developed, based on the use of hydrogen cells. Hydrogen has the advantage a significant increase in cost-effectiveness on the one hand vehicle. At the same time, hydrogen production in the electrolysis process leads to significant energy losses, which is a significant disadvantage of this technology. Industry experts believe that hydrogen vehicles are a better solution than electric vehicles. The hydrogen powertrain in road transport in Europe is still in the initial testing phase.[28] (see Fig.4.)

The diesel engine will remain the standard now, as it currently dominates the industry. However, in transport, mainly in urban areas, faster popularization will take place in electric and CNG vehicles, and LNG-powered vehicles on long routes. Given that 95% of heavy goods vehicles in Europe were powered by diesel engines in 2018, there is

[27] Transport.ec.europa.eu „*White paper 2011“* :https://transport.ec.europa.eu/white-paper-2011_en [retrieved on January 18, 2023]
[28] Morawski I., Defratyka I, Laszkowski , A.Kalisiak (2022) *„Road transport in Poland 2021+“:* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 15, 2023], p. 81

huge potential for the use of alternative drives[29]. To make more use of this, the availability of refueling and charging infrastructure must improve.

A faster growth in the popularity of this type of vehicles can be expected. With all new fuels, public administration support is necessary to popularize them, and they are not expected to be deployed on a large scale by 2025.[30]

Fig.4 *Impact of alternative drivers* Source: https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 18, 2023]

2.3 Autonomous vehicles

The lack of truck drivers will accelerate the development of the most advanced technology, i.e. autonomous vehicles. (see Fig.5.) Fully autonomous trucks should be expected in the perspective of more than 10 years. The changes would also require a change in the road infrastructure and, most of all, in the legislation. With the introduction of fully autonomous vehicles. This will reduce the demand for drivers and increase their number demand for specialists in autonomous systems e.g. programming, configuration, maintenance, daily supervision.

In the shorter perspective up to few years these may be autonomously supported vehicles, including systems and ensure substantial driver support. In the near future, partial autonomy in the form of a convoy of vehicles with one driver for several

[29] Wisniewski J. (2022) : *„ Polish electromobility needs support*“, https://raport.togetair.eu/air/the-future-of-transport/polish-electromobility-needs-support?print_version=1 [retrieved on January 18, 2023]

[30] Transport of the future (2022): *“Report on prospects for the development of road transport in Poland in 2020-2030”,* prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 18, 2023]

vehicles will become more popular. This solution can be used on motorways and expressways.

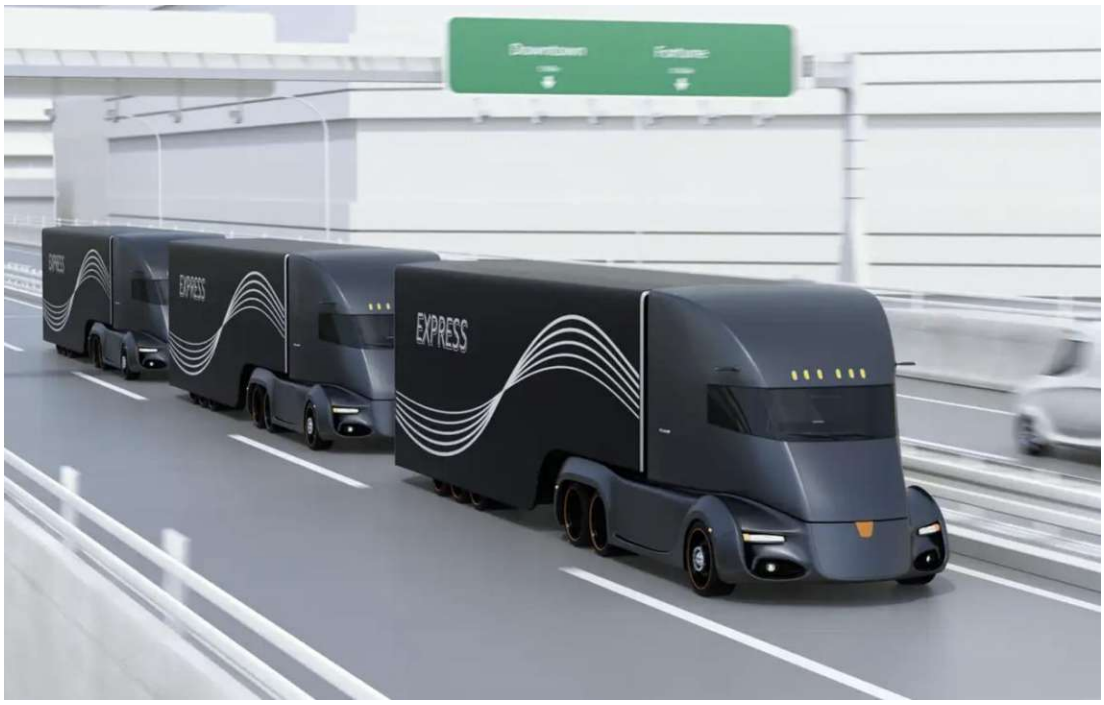

Fig.5 *Autonomous Trucks* Source: https://seekingalpha.com/article/4521563-tusimple-stock-buy-a-disruptor-and-leader-in-autonomous-trucks[retrieved on January 18, 2023]

„In freight transportation, several companies are working to develop autonomous trucks, including TuSimple, which is partnering with UPS to conduct test operations in Arizona and Texas. Today, TuSimple trucks still have a driver on board ready to take over".[31] Unfortunately, however, such tests and experiences are sometimes combined with failures. In year 2022, a semi-trailer truck operated by TuSimple, which was travelling on I-10 in Tucson, Arizona, suddenly swerved left, hitting a concrete bulkhead. The Wall Street Journal confirmed that explanations from TuSimple, described as "human error", are insufficient.[32]

[31] Marr B. (2022): *„The 3 Biggest Future Trends In Transportation And Mobility"* https://www.forbes.com/sites/bernardmarr/2022/01/20/the-3-biggest-future-trends-in-transportation-and-mobility/?sh=2fa96cb63783 [retrieved on January 18, 2023]

[32] Hawkins A.J. (2022): *„TuSimple reportedly tried to pass off a self-driving truck crash as 'human error'"* https://www.theverge.com/2022/8/4/23288794/tusimple-self-driving-truck-crash-investigation [retrieved on January 20, 2023]

2.4 Megatrucks

It is not just the engine builders truck manufacturers who are thinking about changes and the future of their vehicles. Trailer manufacturers are also thinking about new solutions. The technology that may be used in European transport in the near future is the so-called *Megatrucks*.(see Fig.6.) Longer Heavier Vehicles (LHVs) are heavy goods vehicles larger than standard. LHV most often refers to vehicle units with a length exceeding 18.75 m and gross vehicle weight over 40 tons. Such vehicles are found in Australia and the USA. This may be the answer to the lack of drivers and CO2 reduction thanks to the smaller number of vehicles needed to carry a certain amount of cargo. The large-scale introduction of LHV requires modernization of the infrastructure and substantial financial expenditures. Therefore, this may be the reason for the slow processing of such solutions by the European Parliament.

Fig.6 *Long Heavier Vehicle* Source: https://4trucks.pl/aktualnosci/15115/niemcy-dalej-rozbudowuja-siec-drogowa-dla-zestawow-lhv [retrieved on January 19, 2023]

2.5 Electrification in the trailer business

E-Mobility is changing technology changer for the complete commercial vehicle industry. Customers like fleets and end users are more and more focused on “green transports”. This also applies to trailers and this business. One of the pioneers in solutions for trucks, company SAF Holland presented electric axles for semi-trailers in year 2018. To make commercial vehicles more eco-friendly and reduce fuel consumption, but also carbon and particulate emissions, the axle manufacturer uses recuperation for energy recovery. *SAF TRAKr* and *SAF TRAKe* electric modular axles

offer advanced technologies and are a sustainable solution for logistics and transport processes.[33] (see Fig.7,8,9.)

Alexander Geis, CEO of *SAF Holland Group* said „We are simultaneously committed to helping reduce the total cost of ownership and helping our customers comply with ever more stringent noise and emissions restrictions" [34]

Fig.7 *E-Axle* source: www.safholland.com

The use of electrified trailer axles gains importance, especially for refrigerated trailers and inner city applications. The main design principle is the central located High voltage generator unit (max. 26 kW), which converts the trailer's kinetic energy into electrical energy that can be used to power the trailer's electrical receivers. The lithium-ion battery is the storage place for the generated energy. Main applications are coolers, tankers, silo semi-trailers. The advantage for the drivers is fully automatic operational strategy and system and noise reduction of reefer unit during driving.

[33] Safholland.com *„ E-axle family from SAF"*: https://safholland.com/ch/en/download-center/document/resource/environment/project1_p/documents/documentationP/2022/2022_09/SAF-HOLLAND_E-Axles_en-DE.pdf [retrieved on January 19, 2023]
[34] Writer S. (2019): *„ SAF-Holland and LOHR Industrie partner on e-axles",* https://www.globaltrailermag.com/2019/05/20/saf-holland-and-lohr-industrie-partner-on-e-axles/ [retrieved on January 19, 2023]

Fig. 8 *SAF TRAKr* Source: www.safholland.com

The SAF TRAKe is using recuperation to generate energy. The SAF TRAKe is the support for the main engine when starting and accelerating. Different operating modes allow the energy to be used to power the vehicle and support the truck engine. This axle operates with a more powerful high-voltage electric machine with a higher output. The SAF TRAKe ensures the stability of the set and better traction. The lithium-ion battery is the energy storage place.[35]

Fig. 9 *SAF TRAKe* Source: www.safholland.com

[35] Safholland.com,, *E-axle family from SAF"*: https://safholland.com/ch/en/download-center/document/resource/environment/project1_p/documents/documentationP/2022/2022_09/SAF-HOLLAND_E-Axles_en-DE.pdf [retrieved on January 19, 2023]

2.6 Drones deliveries, last mile delivery optimization and warehousing digitlization

There is intense activity all over the world of *the e-commerce* market, i.e. retail trade using electronic channels. The World Economic Forum foresees believes that this trend will continue and in 2026 online trade will account for the average over 40% of total retail sales (compared to the current 10%). The most challenging step in organization of the process of physical movement of goods is *the last mile*.[36] *The last mile* in logistics is often described as the most expensive, most inefficient and most polluting step in the supply chain.[37] That is why drones are often mentioned as an innovation of great importance for development of logistics and supply chain management. The company from the area research on technologies - *Tractica* predicts that by 2025 the demand for drones will increase several times.[38] „Mapping or parcel delivery – there are many applications for commercial drones. Analysts at Tractica are projecting that drones and multicopters will be used at increasing rates in the professional sector".[39] (see Fig.10.)

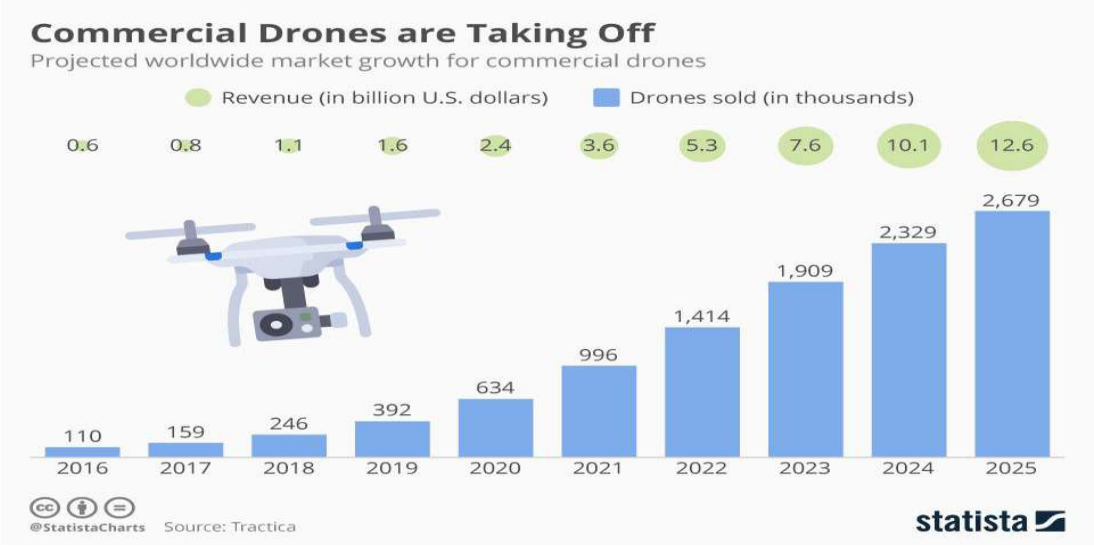

Fig.10 Commercial drones Source: https://www.statista.com/chart/17201/commecial-drones-projected-growth/ [retrieved on August 14, 2023]

[36] Weforum.org *„Shaping the Future of Retail for Consumer Industries" (2017)*: https://www3.weforum.org/docs/IP/2016/CO/WEF_AM17_FutureofRetailInsightReport.pdf [retrieved on August 14, 2023], p.4

[37] Lim S.F.W., Jin X., Srai J.S, Consumer-Driven E-commerce (2018), *„International Journal of Physical Distribution & Logistics Management*", Vol. 48, No. 3.

[38] *Drone for Commercial Application*, (2019) Tractica, p.5

[39] Buchholz K. (2019), „ Commercial Drones are Taking Off": https://www.statista.com/chart/17201/commecial-drones-projected-growth/ [retrieved on August 14, 2023]

Drones are becoming more and more widely used in everyday life. These devices are used for recreation, preparation of photo or video materials at various family or mass events, they are permanent equipment of the army, and now they are also appearing in the TSL industry. Drones, otherwise Unmanned Aerial Vehicle – UAV or Unmanned Aerial Systems – UAS, are flying robots that are piloted remotely or programmed they fly autonomously.[40]

Broader use of drones in logistics took place in 2013, when *Amazon.com* announced the Amazon Prime Air program and announced that soon thanks to these devices it will be able to deliver parcels weighing up to approx. 2.5 kg within 16 km within 30 minutes. Then, companies such as *DHL, UPS and FedEx* showed similar activities in the use of drones.[41] (see Fig.11.)

The use of drones in logistics can be wide

- internal logistics of the company - shipment of cargo files or documents between geographically dispersed company locations[42]
- monitoring the condition and security of facilities
- last-mile logistics deliveries in highly urbanized areas[43]

[40] Giones F., Brem A., (2017) *From Toys to Tools: The Co-Evolution of Technological and Entrepreneurial Developments in the Drone Industry, „Business Horizons"* , Vol. 60, No. 6, p.875-880

[41] Mattise N. (2013): *„Amazon unveils "Prime Air," a plan to deliver by drone in just 30 minutes"* https://arstechnica.com/gadgets/2013/12/forget-amazons-two-day-shipping-soon-you-can-select-drone-delivery/ [retrieved on August 14, 2023]

[42] Geodis.com https://geodis.com/pl/newsroom/informacje-prasowe/inwentaryzacja-magazynu-za-pomoca-dronow-geodis-i-delta-drone-weszly-w-faze-produkcji-przemyslowej-calkowicie-zautomatyzowanego-rozwiazania [retrieved on August 14, 2023]

[43] Dhl.com (2019) https://www.dhl.com/global-en/home/press/press-archive/2019/dhl-express-launches-its-first-regular-fully-automated-and-intelligent-urban-drone-delivery-service.html [retrieved on August 14, 2023]

Fig.11 Drones in logistics Source: https://www.dhl.com/global-en/home/press/press-archive/2019/dhl-express-launches-its-first-regular-fully-automated-and-intelligent-urban-drone-delivery-service.html [retrieved on August 14, 2023]

Drones are a part of technology 4.0 used in the transport, logistics and forwarding sectors. Urban Air Mobility pioneer *Volocopter* and logistics operator *DB Schenker* announced in year 2021, that they have successfully conducted a joint static *Proof of Concept* (PoC) for the use of *VoloDrone* in the Stuttgart exhibition and trade fair center logistics. With support from *Fraunhofer Institute for Material Flow and Logistics*, partners create first logistics ground operations project with electric cargo drones.[44]

„ *The VoloDrone* unlocks new possibilities for the logistics industry, and it represents a key element for *DB Schenker's* innovation and sustainability roadmap for logistics"[45] said *Erik Wirsing*- Global Head of Innovation, *DB Schenker.* (see Fig.12.)

[44] Volocopter.com *„Volocopter and DB Schenker Announce First Blueprint for VoloDrone Operations"*: https://www.volocopter.com/newsroom/volocopter-and-db-schenker-announce-first-blueprint/ [retrieved on August 15, 2023]

[45] *„Volocopter and DB Schenker Announce First Blueprint for VoloDrone Operations":* https://www.volocopter.com/newsroom/volocopter-and-db-schenker-announce-first-blueprint/ [retrieved on August 15, 2023]

Fig.12 The VoloDrone, Source: https://www.volocopter.com/newsroom/volocopter-and-db-schenker-announce-first-blueprint/ [retrieved on August 15, 2023]

„The VoloDrone, Volocopter's heavy-lift and versatile cargo drone, is battery powered, can transport a 200 kg payload up to 40 km, and has 18 rotors and motors powering the electric vertical take-off and landing aircraft."[46]

To optimize work in the warehouse, digitization of the warehouse is needed. Digital warehouses are modern logistics, often external, which provides flexibility and the ability to implement volumes. *Warehouse Management System* is a part of any digital warehouse. *Warehouse Management System* (WMS) supports the monitoring, customization, control of logistics operations in warehouses and tracks inventory that is stored, received, packed and shipped in the most efficient way.[47]

[46] Volocopter.com *„Volocopter and DB Schenker Announce First Blueprint for VoloDrone Operations"* https://www.volocopter.com/newsroom/volocopter-and-db-schenker-announce-first-blueprint/ [retrieved on August 15, 2023]
[47] Lopienski K. (2021): *„Understanding The Future Of Warehouse Digitalization"* https://www.shipbob.com/blog/digital-warehousing/ [retrieved on August 16, 2023]

3. The road transport industry in Poland

For many sectors of industry and trade, transport is the most important element of the supply chain. It is estimated that Polish transport has a key impact on 50% of the country's GDP. Thanks to transport, Polish production companies joined the international production system. Road transport helps Polish trading companies to develop on the domestic and European market. On the other hand, foreign companies can optimize logistics costs thanks to transport companies in Poland.[48]

„This estimation is based on a calculation of the share of 80 commodity and service items included in non-payroll expenses of 75 trades, performed on the basis of tables of consumption from national accounts. Road transport of commodities is of significance for those trades and at the same time constitutes one of their 10 key cost items. In total, these trades generate 50 percent of the GDP. The list of trades dependent on road transport of commodities most, includes retail and wholesale trade, paper processing, chemical processing, production of construction materials and the agricultural and food sector".[49]

Polish transport companies began their development in 2004, when Poland joined the European Union. One of the main factors of this development in the last years has certainly been the removal of customs barriers in the EU, Poland's geographical location, easy access to means of transport, lower employment costs in Poland than in Western countries and the ability of Polish carriers to conquer the market. It should also not be forgotten that the development of Polish road transport would not be possible on such a scale without EU funds.[50]

The liberalization of the automotive market and the international activity of Polish carriers were other elements that helped the development of this industry, which is important for the Polish economy.

A well-developed road network is an indispensable element of the development of the economy and the transport industry. Upon entering the European Union on May 1,

[48] Morawski I., Defratyka I, Laszkowski , A.Kalisiak (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 20, 2023],
[49] Morawski I., Defratyka I, Laszkowski , A.Kalisiak (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 20, 2023] p.17
[50] Ambroziak, L., Markiewcz, J., Strzelecki, J., Swiecicki, I., Wasinski, M. (2023), *„How Poland benefits from the single market"* https://pie.net.pl/wp-content/uploads/2023/07/PIE-Raport_Jednolity_rynek_2023-EN.pdf [retrieved on January 20, 2023]

2004, Poland had over 610 km of expressways. From 2002 to the end of 2021, Poland spent about 53 billion Euro on investments in national roads. Funds from the European Union have a large share in the implementation of road investments. Since 2004, we have received over 25 billion Euro in co-financing. (see Fig.13. and 14.)

Fig.13 „ the network of expressways in Poland in 2004“

Fig.14 „ the network of expressways in Poland in 2022“

Source: https://www.gov.pl/web/gddkia/od-20-lat-dbamy-o-utrzymanie-i-rozwoj-infrastruktury-drogowej-w-polsce2

Since 2004, the number of expressways in our country has increased by almost 3,750 km, including 2,426.5 km of expressways and over 1,322 km of highways.[51]

The dynamics of transport by Polish carriers in 2018-2022 will be continuing to grow, but at a much slower pace compared to the current period due to the projected economic slowdown.(see Fig.15.)

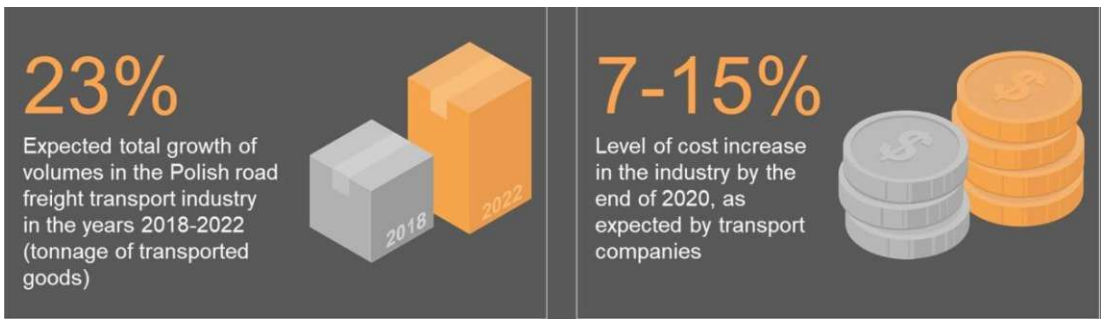

Fig.15 „ *Development of the Polish road freight sector* Source:https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 21, 2023]

[51] Gov.pl „*Od 20 lat dbamy o utrzymanie i rozwój infrastruktury drogowej w Polsce“* (2022) : https://www.gov.pl/web/gddkia/od-20-lat-dbamy-o-utrzymanie-i-rozwoj-infrastruktury-drogowej-w-polsce2 [retrieved on January 20, 2023]

3.1 Historical overview

Historical review shows that Poland has its ties related to the industry of transport vehicles and the transport industry. Different periods and milestones show how important this industry has been in history. This is an important starting point for current times and the dynamic changes taking place in the entire industry.

The component of prosperity includes transport, which plays a significant role in the history of civilization. It influenced the degree of communication of societies, conditioning their development, and in the case of insufficient communication, stagnation or even recession followed. In the era of agricultural civilization, transport was very primitive, there was no mechanical drive, then human or animal traction power was used. River currents or winds were used as natural propulsion. The industrial revolution contributed to the greatest changes in transport in its entire history. This marked the beginning of a new era in transport, the so-called era of mechanized transport.[52]

The history of road transport in Poland is related to the history of the global automotive industry. Due to all the events in Poland and different periods, the history of road transport in Poland had a varied course. The first documented car made in Poland is considered to be the "Star" car, produced in 1912. It was a two-seater vehicle that started the history of the Polish automotive industry.[53]

After the Second World War, the Polish automotive industry began to be rebuilt. The first post-war car was the „Star 20“ truck. The first five copies of these cars were presented for the first time in December 1948. „Star 20“ contributed to the rapid reconstruction of the country from war damage and the development of Polish road transport.

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[52] Wiktorowska-Jasik A. (2016): ” *The development of road transport in historical terms - the most important achievements of the global automotive industry* ”: http://www.sitkszczecin.org.pl/images/transport_logistyka_porty/2016/1-2016/rozwoj_transportu_drogowego_w_ujeciu_historycznym_%E2%80%93_najwazniejsze_osiagniecia_swiatowej_motoryzacji.pdf [retrieved on January 22, 2023]

[53] Wiktorowska-Jasik A. (2016): *” The development of road transport in historical terms - the most important achievements of the global automotive industry ”* http://www.sitkszczecin.org.pl/images/transport_logistyka_porty/2016/1-2016/rozwoj_transportu_drogowego_w_ujeciu_historycznym_%E2%80%93_najwazniejsze_osiagniecia_swiatowej_motoryzacji.pdf [retrieved on January 22, 2023]

The production plants in the city of Starachowice produced over 50,000 of „Star 20“ model. This car had a load capacity of 3.5 tons and fuel consumption oscillated around 26 l/100 km. The successor of this model was the „Star 21“ model, which had an increased load capacity of 4 tons.[54] (see Fig.16. and 17.)

Fig.16/17 *The first Polish truck „Star 20“* Source: https://poznan.naszemiasto.pl/samochody-prl-u-star-20-pomagal-w-odbudowie-kraju/ar/c4-2248350

The next „Star 25“ model was very successful and dominated Polish roads in the 1960s. The next version of the truck model was the „Star 27“, which was already equipped with a diesel engine. The year 1976 turned out to be the peak moment in the history of „Star“ trucks. 26,000 vehicles were produced then, a number that will never be exceeded again.[55] (see Fig.18 and 19.)

Fig.18/19 „ *Star 27“ and „Star 28“* Source: https://legendastara.pl/historia-fsc/

In December 1999, the German concern MAN became the owner of the Star factory in Starachowice. Among other things, the production of „Star“ trucks was transferred

[54] Legendastara.pl „ *Historia Stara“:* https://legendastara.pl/historia-fsc/ [retrieved on January 22, 2023]
[55] Legendastara.pl „ *Historia Stara“:* https://legendastara.pl/historia-fsc/ [retrieved on January 22, 2023]

quite quickly to the MAN plant in Steyr-Austria (former Steyr Daimler Puch AG plant). „Star“ cars were also produced in Austria until the end of 2006. The last batch of Star trucks left the assembly line in Poland in 2006. In 2007, the sale of Star trucks was officially finished.[56] (see Fig.20.)

Fig.20 „ *Star S2000 – Production in Poland and Austria“* Source: https://pl.wikipedia.org/wiki/Star_S2000

In 1957, a transport company called *PMPS PEKAES* was founded in Poland. At the beginning of its operation, 10 Magirus Jupiter trucks with trailers transported fishmeal to Switzerland and returned with industrial products. *PMPS PEKAES* purchased Volvo F88 and F89 trucks serving profitable contracts in the Middle East, including Kuwait, Irak and other countries from the region. These routes were up to 3,000 km one way.(see Fig.21. and 22.)

Fig. 21 „ *PMPS Pekaes company and Magirus truck*“ Source: https://wmeritum.pl/57-lat-temu-zalozono-przedsiebiorstwo-pekaes/131160

[56] Legendastara.pl „ *Historia Stara“* : https://legendastara.pl/historia-fsc/ [retrieved on January 22, 2023]

Fig. 22 „ *PMPS Pekaes company"* Source: https://historia.interia.pl/aktualnosci/news-tym-sie-wozil-pekaes,nId,2563329

In the 80's, the company purchased a large batch of Volvo F12 trucks, which formed the largest part of the fleet, which at its peak consisted of 1,352 trucks and around 2,000 trailers, employing around 4,500 employees. At that time, *PMPS PEKAES* had a monopoly position in the transport of goods in Poland. In 2008-2010, it was decided to liquidate the fleet of trucks and transform the company into a typical logistics operator focused on the distribution of general cargo and the sale of orders to other carriers.[57]

In the last 25 years, we can identify three significant periods in the history of road transport in Poland.[58]

- Political changes in the years 1988-1991 - related to the transition from the socialist system to democracy.
- Preparing the Polish economy for integration with Western Europe in 1992-2004
- Poland's presence in the European Union since May 1, 2004

The road transport development process in 1988 started from a very low level because the road infrastructure and automotive level in Poland after the period of socialism was very weak and destroyed. Restructuring of large state-owned transport enterprises has

[57] Perzanowski M.(2015): *„57 lat temu założono przedsiębiorstwo PEKAES"* https://wmeritum.pl/57-lat-temu-zalozono-przedsiebiorstwo-pekaes/131160 [retrieved on January 22, 2023]
[58] Paprocki W. (2015): *" Polish transport system. 10 years in European Union" under the scientific editorship of Jana Pieriegu,* Warsaw School of Economics, Warsaw, p. 13-14

been carried out since 1992. Another element influencing the dynamics of the development of road transport in Poland was the increase in demand for road transport services, caused by the development of industrial production and foreign trade in goods. Individual consumption has also increased. Since 2004, when Poland joined the EU, intensive development of the road network and infrastructure has begun. After joining the EU, the structure of retail trade and the development of e-commerce have also changed in Poland. Demand for transport between production sites and logistics centres has increased. The next stage of transporting these goods is to deliver them from logistics centres to retail outlets. The development of e-commerce entailed the dynamic development of courier services in Poland [59]

3.2 The current position of the road transport industry in the Polish economy

In the last two decades, the Polish road transport industry has been developing thanks to access to the European Union market. It also had a strong impact on the position of this industry in the national economy. The road freight transport sector plays one oft the key role in Poland's economy now.

The key position of road freight transport in Poland is the result of connections with other sectors of the economy, which can function well thanks to efficient transport. Sectors that are particularly strong dependent on transport in Poland are construction, trade and services, and the manufacturing industry. „The road freight transport together with forwarding and logistics forms the sector known as TSL and is one of the important elements of many supply chains in different countries".[60]

[59] Paprocki W. (2015): *" Polish transport system. 10 years in European Union"* under the scientific editorship of Jana Pieriegu, Warsaw School of Economics, Warsaw, p. 15-16
[60] Lacka I., Supron B. (2020): *"Polish road transport of goods in the European Union. Current state and outlook",* Warsaw, p.67

„Transport performance generated in road transport by companies registered in Poland in 2020 amounted to 355 billion tonne-kilometers, and the average annual growth pace during the last decade was 6%“[61].

Currently, Polish road transport is at the best stage of development. The main source of increase is carriage performed entirely outside the territory of Poland - that is cabotage and cross-trade operations.[62](see Fig.23.)

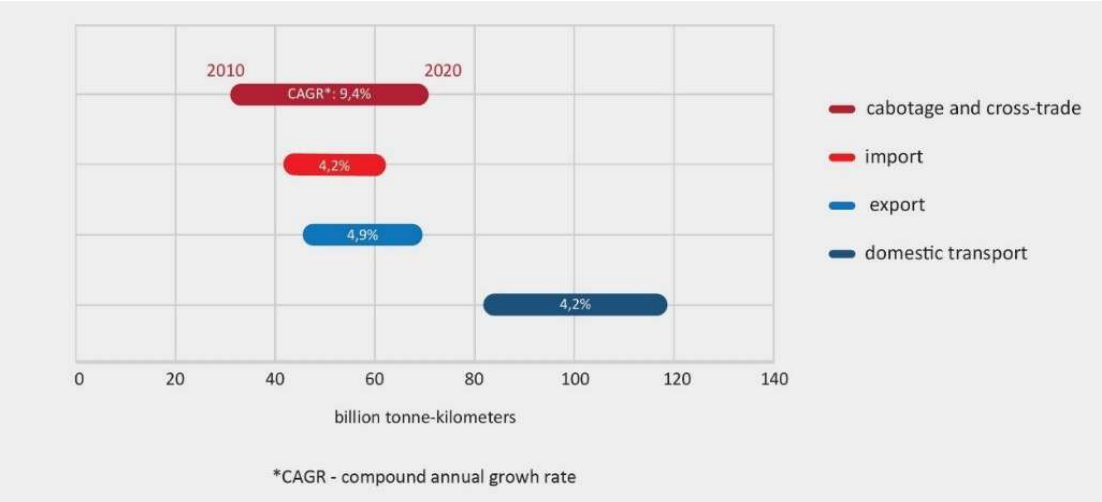


Fig.23 *„ Growth of Polish domestic and abroad transport in 2010-2020“* Source: Ignacy Morawski, Alicja Defratyka, Jakub Łaszkowski, Artur Kalisiak (2022) „Road transport in Poland 2021+“ https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/

European operators open new distribution centres in Poland. Such investments will continue to support development and economic growth in this country. (see Fig.24.)

[61] Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+“:* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p.16
[62] Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) „Road transport in Poland 2021+“: https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p.16

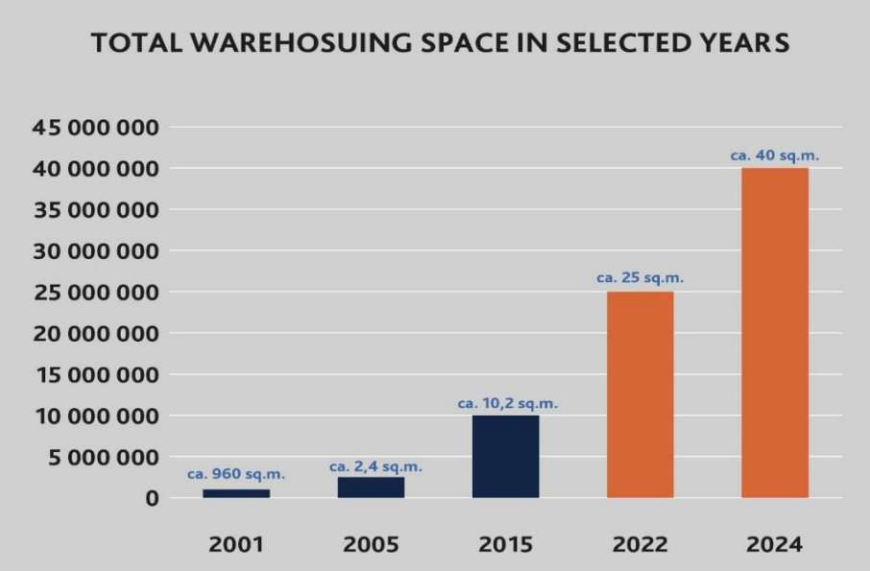


Fig.24 „ *Warehousemarket in Poland 2001-2024"* Source: Newmark Polska https://nmrk.pl/en/warehouse-supply-starting-to-lag-behind-demand-in-poland

In the first quarter of 2022, the volume of investment transactions reached 1.66 billion EUR, which meant an 18% increase compared to the previous year, the value of investments in logistics centers has the highest value and in Q1 2022 amounted to 191 milion EUR. For several years, foreign investors have been willing to invest in the Polish commercial property market.[63] „ More than half (54%) of the warehousing and industrial space in Poland was built in the last five years and the oldest warehouses , only 11% of total, are just over 15 years old".[64] The goods have to be transported to the warehouse centres from the producers and then, after appropriate completion, transported to the distributors.

[63] Pakulniewicz M. (2022): *„Polski rynek magazynowy rośnie jak na drożdżach"* https://trans.info/pl/polski-rynek-magazynowy-rozbudowuje-sie-jak-szalony-291358 [retrieved on February 2, 2023]

[64] Us.jll.com „*Demand, Decarbonization, Digitization, Design"* https://www.us.jll.com/en/trends-and-insights/research/future-global-logistics [retrieved on February 2, 2023]

The forecast for the development of the transport industry for the coming years is based on two factors [65]:

- GDP growth forecast of 3% in 2018-2022, indicate a higher demand for domestic transport services in Poland
- a positive level of foreign trade caused by an increase of 7% in 2018-2020

Over 4% of economic investments in Poland are funds for road transport. The growing importance of the so-called investments in transport, such as the investment rate - i.e. the so-called share of investment in GDP is one of the most important economic policy objectives, put first in the so-called Plan for Responsible Development of 2017 and National Recovery Plan 2021.[66] (see Fig.25.)

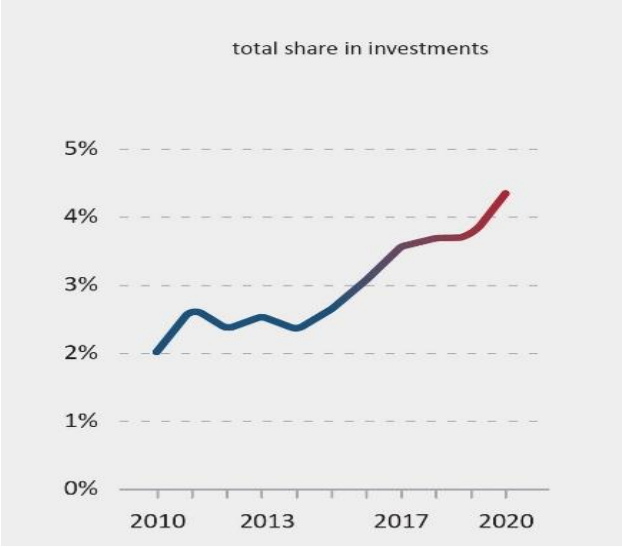


Fig.25 *„ The significance of road transport for domestic investment"* Sorurce: https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/

[65] Transport of the future (2022): *"Report on prospects for the development of road transport in Poland in 2020-2030",* prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 28, 2023]

[66] Morawski I., Defratyka I, Laszkowski , A.Kalisiak (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p.23

Companies such as Zalando, Lidl, Amazon or Ikea are willing to invest in Poland and the reason for this is the good location. Such a growing investment demand generated by transport industry also affect domestic development production and trade in transport equipment and parts. „Poland is the eighth exporter of trucks in Europe and the fifth exporter of automotive parts. This trade also produces parts for transportation equipment".[67]

Good location and positive economic forecasts should translate into an increase in the volume of road transport.

„Between 2008 and 2017, GDP in real terms increased by more than 30%, driven by average growth close to 3.2% per year. (see Fig.25.) The domestic market for imported goods measured by tonnage increased by 37% in that period, growing at an average annual rate of nearly 4%"[68]. In year 2023, the forecast economic growth GDP in Poland is at the level of 3%.[69]

GDP dynamics should slow down in Poland soon, but in the next 10 years Poland will catch up with developed economies. Large and absorptive domestic market and increasingly prosperous society, will translate into high demand. The reason for the attractiveness of foreign investments in Poland compared to Western Europe are lower labor costs.

[67] Morawski I., Defratyka I, Laszkowski , A.Kalisiak (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p.23

[68] Transport of the future (2022): *"Report on prospects for the development of road transport in Poland in 2020-2030*", prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 28, 2023]

[69] Oecd.org https://www.oecd.org/poland/ [retrieved on January 28, 2023]

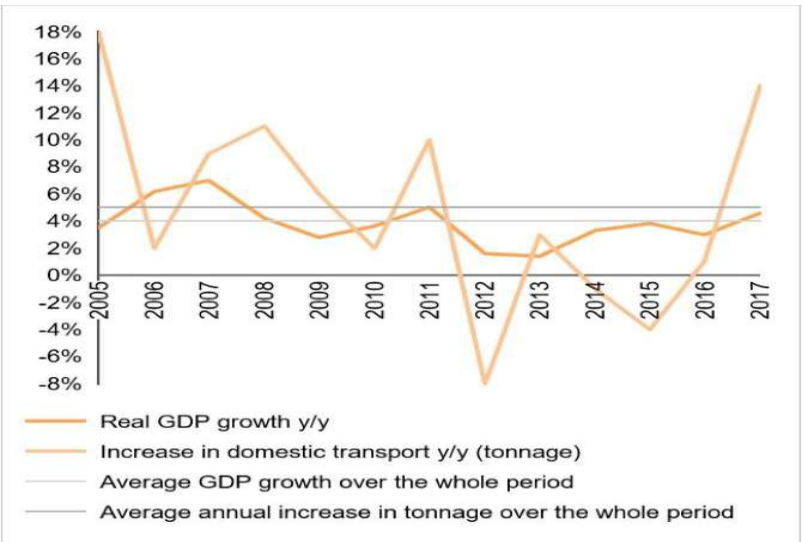


Fig.26 „ *Annual growth rates of real GDP and domestic road transport sector in Poland (tonnage) in 2005-2017* "

Source: Eurostat

One of three largest industries in Poland in terms of the largest taxes - direct and indirect, social insurance, as well as other charges is road transport sector. On average, transport companies in Poland pay about 4 billion EUR in taxes, premiums and other a year levies for the state budget, local government units and non-budgetary public funds.(see Fig.27.)

They are taxes like[70]:

- CIT - corporate income tax
- PIT (employee income tax)
- VAT (on value added tax)
- employees' social security contributions, tolls, excise duty and other sectoral taxes

[70] Transport of the future (2022): *"Report on prospects for the development of road transport in Poland in 2020-2030*", prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 28, 2023]

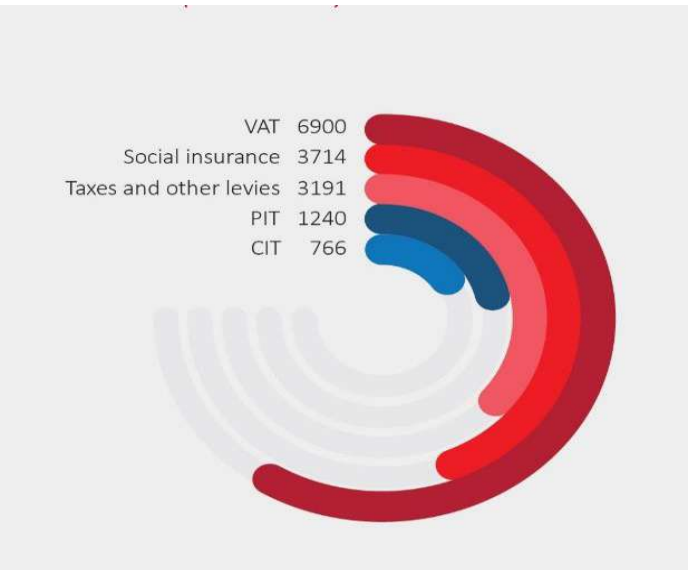


Fig.27 *„ Taxes and other levies paid by road transport companies in 2019 (PLN million)"*

Source: https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html

The Polish Road Transport Institute has prepared a report "Transport and Logistics as a strategic industry for the Polish economy" published in 2019. Based on the analyses carried out, it was indicated that in 2018, over 500 m.Euro was transferred from transport companies to the National Road Fund (fund financing the maintenance and development of roads in Poland) in 2018 only from tolls. In the first half of 2019, almost 400 m.Euro. Road tolls in Poland apply to all vehicles over 3.5 tons of load capacity.[71]

In year 2020, the export of transport services from Poland amounted to 16.3 billion EUR. It is 28 % services exports and about 6 % of total goods and services. Poland recorded large surpluses in trade in transport services, reaching approximately 8.7 billion EUR.[72]

About 750,000 people are employed in road transport in Poland, and the entire logistics sector in Poland employs almost a million people. Unfortunately, there is no precise data on employment in road transport of goods in Poland, as it is not a separate statistical category. The entire transport and warehousing sector includes

[71] Lacka I., Supron B. (2020): *"Polish road transport of goods in the European Union. Current state and outlook*", Warsaw, p.85
[72] Morawski I., Defratyka I, Laszkowski , A.Kalisiak (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p.24

transportation passengers and goods, all modes of transport and all services related to transport. In the last ten years, the average increase in employment in road transport in Poland amounted to 4.5 % annually. There are five groups of industry professionals who determine the competitiveness of transport companies and quality their services: drivers, forwarders, dispatchers logistics, truck mechanics[73]. Employment in the transport and logistics industry accounts for over 7% of all employees in Poland. The road transport is ranked fifth among the branches of industry in Poland and has a large impact on the functioning of the entire economy.

3.3 Changes in the road transport industry in Poland

Achieving the long-term goals set by the European Union relating to sustainable development, competitiveness and inclusive growth require significant investments. The main goal for the EU's transport department is to create a Single European Transport Area with low-emission mobility and safe transport infrastructure. All these processes of change in the transport industry also apply to Polish transport.

International transport of goods, for which Poland is a transit country, is of key importance for the economy of our country. Every day, thousands of trucks move around the country, transporting goods on the west-east axis (from Western Europe - mainly from Germany to Russia and other eastern countries and in the opposite direction), and on the north-south axis (from the Baltic ports - in Gdansk and Gdynia, inside the continent). It is the trucks that are the main beneficiary of expressways and highways. In the last years, the road transport sector has undergone a number of changes. Ensuring high-quality transport services and infrastructure availability is of key importance for the development of the Polish economy. They are an important factor in creating high competitiveness of the economy compared to other European Union countries, contributing to positive changes.

[73] Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p.58-59

	GVM UP TO 3.5 TONNES		GVM 3.5 - 16 TONNES		GVM OVER 16 TONNES		TOTAL	
	NUMBER	ANNUAL AVERAGE DYNAMICS (5 YEARS), IN PERCENT	NUMBER	ANNUAL AVERAGE DYNAMICS (5 YEARS), IN PERCENT	NUMBER	ANNUAL AVERAGE DYNAMICS (5 YEARS), IN PERCENT	NUMBER	ANNUAL AVERAGE DYNAMICS (5 YEARS), IN PERCENT
Total	2 080 257	2,2%	315 212	0,5%	410 117	5,3%	2 805 586	2,4%

Table 1. *„ The fleet of goods vehicles in Poland according to Gross Vehicle Weight (GVW) 2020"* Source: https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/

There are 2.08 million trucks registered in Poland, according to the Central Register of Vehicles and Drivers. The vast majority - as much as 70 percent - are vehicles with a gross vehicle weight (GVW) up to 3.5 tonnes. 13 %- of vehicles of GVW above 16 tonnes and 11 % of the fleet consists of vehicles of GVW of 3.5 - 16 tonnes. In the category of vehicles with a GVW above 16 tons, they are the majority truck tractors, i.e. trucks equipped with a fifth wheel connected to the semi-trailer[74]. This is the most important type of transport used in international transport. (see Table 1.)

In combination with a semi-trailer, it gives the possibility of transporting loads of 40 tons. Sometimes special transports exceeding 40 tons are allowed.(see Fig.28.) Such sets are universal, and we can apply them to many types of road transport, depending on the transported load. When changing the type of load, only a different semi-trailer should be attached to the truck tractor. It is the most flexible and economical solution. Such a set also makes manoeuvring easier, e.g. in distribution centres or factories.

Fig.28 *„ Truck tractor with the semi-trailer"* Source: https://koma-trans.pl/flota/

[74] Stat.gov.pl „*Statistics Poland*": https://stat.gov.pl/en/ [retrieved on February 10, 2023]

The fastest-growing category in terms of GVW in Poland are trucks above 16 tonnes. In the period of five years, their number increased by almost 30%. Number of truck tractors grows the fastest - by 40 % in years 2015-2020.

Among vehicles with a GVW over 16 tonnes, the number of which is growing the fastest except for road tractors, there is a noticeable increase in the number of tankers and undefined vehicles, including various specialized ones, e.g. for the bulk materials, fuels, transport of animals, cars[75]. That shows that Polish companies are changing their transport profile to a more specialized one. They invest funds in equipment adapted to the needs of customers and the market. This indicates the trend of specialization of heavy goods vehicles.

There are 357,415 semi-trailers registered in Poland, including 347,128 semi-trailers with gross vehicle weight exceeding 16 tonnes. More than 40 % of all semi-trailers are dropside bodywork units, known as curtain semi-trailers. Tippers constitute more than 17 % and closed box trailers -more than 14%. These three types thus constitute 70 % of the semi-trailer fleet in Poland[76].

	GVM UP TO 3.5 TONNES		GVM 3.5 - 16 TONNES		GVM OVER 16 TONNES		TOTAL	
	NUMBER	ANNUAL AVERAGE DYNAMICS (5 YEARS), IN PERCENT	NUMBER	ANNUAL AVERAGE DYNAMICS (5 YEARS), IN PERCENT	NUMBER	ANNUAL AVERAGE DYNAMICS (5 YEARS), IN PERCENT	NUMBER	ANNUAL AVERAGE DYNAMICS (5 YEARS), IN PERCENT
Total	5 905	0,8%	4 382	0,9%	347 128	6,7%	357 415	6,5%
Dropside	4 291	0,3%	2 366	0,3%	146 897	4,6%	153 554	4,4%
Dumper	127	0,3%	137	0,7%	62 327	8,8%	62 591	8,7%
Box	314	1,3%	463	5,3%	50 866	6,1%	51 643	6,1%
Platform	30	4,6%	33	5,7%	34 285	18,8%	34 348	18,8%
Other	861	3,2%	1 043	0,9%	26 062	5,8%	27 966	5,5%
Cistern/tank	168	0,5%	146	0,0%	12 081	5,5%	12 395	5,4%

Table 2. *„ The fleet of semi-trailers in Poland according to Gross Vehicle Weight (GVW) 2020"* Source: https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ \

[75]Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p. 72
[76] Stat.gov.pl *Statistics Poland* : https://stat.gov.pl/en/ [retrieved on February 10, 2023]

The fastest growing categories are platforms, tippers and closed box semi-trailers. The number of registered box semi-trailers is growing faster than the number of platform semi-trailers, which confirms that Polish companies invest more funds in specialized equipment. (see Table 2.)

For the transport of goods, a semi-trailer with a closed box is used, which requires more sophisticated security measures than an ordinary tarpaulin. For example, regulating and monitoring the temperature inside. Semi-trailers with a closed body are also better adapted to the assembly of multi-level surfaces, the so-called „double-deck" often also used for LTL transport for commercial purposes in e-commerce business[77].This also confirms further changes in Polish road transport, which adapts quickly and effectively to the changing trends on the market. This is in addition to the information about the increase in investments in logistics and reloading centers where this type of trailers is used.(see Table 3.)

Changes that are taking place in the structure of equipment used in road transport in Poland are visible and include mainly vehicles for the transport of liquids, liquid foodstuffs, gases, bulk materials and hazardous materials. There are also more and more small categories on the market, such as so-called inloaders for transporting glass.

NO.	USE	NUMBER	ANNUAL AVERAGE DYNAMICS(5 YEARS), IN PERCENT
1.	Universal (or no specification)	2 872 292	2,4%
2.	Other	94 875	0,5%
3.	Refrigerator	66 721	5,1%
4.	Vehicles	66 359	8,9%
5.	Isothermic	41 403	3,3%
6.	Containers	29 200	3,4%
7.	Live animals	18 635	2,1%
8.	Valuable goods	11 276	0,0%
9.	Waste	6 960	3,5%
10.	Fuels	6 564	3,1%
11.	Concrete	6 378	1,8%
12.	Loose materials	4 740	9,3%
13.	Milk	2 558	3,2%
14.	Hazardous materials	1 767	8,3%
15.	Cement	1 633	0,1%
16.	Liquid foods	1 485	11,1%
17.	Gas	1 417	9,2%
18.	Liquids	1 243	12,0%
19.	Freezer	1 093	3,1%
20.	Cables	689	12,0%

Table 3. *„ The fleet of semi-trailers in Poland according to Gross Vehicle Weight (GVW) and type of bodywork (2020)*

Source: https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/

[77]Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p. 75-76

The demand for specialized infrastructure in Poland is growing faster than for universal infrastructure, the reason for these changes is the specialization in industrial supply chains. The more diverse is the supply chain in the industry, the more it transports intermediate goods needed for production. This increases the demand for specialized transport and thus changes the structure of equipment purchases by transport companies in Poland.

The fleet of heavy goods vehicles and truck tractors in Poland are becoming increasingly modern in terms of environmental requirements. European standards, as for passenger cars, specify exactly the exhaust emissions amounts of carbon dioxide, other gases and particulates. This counts for every kilometre travelled. The level of achievement for these standards is getting higher and higher. Road tolls can be a factor that encourages companies to buy new vehicles[78]. This also affects a number of changes in the road transport industry in Poland. In the Polish toll system, the rate per kilometre depends on from the road class, the permissible total weight of the vehicle and its Euro classes. Toll costs are reduced if the emission standard is higher.

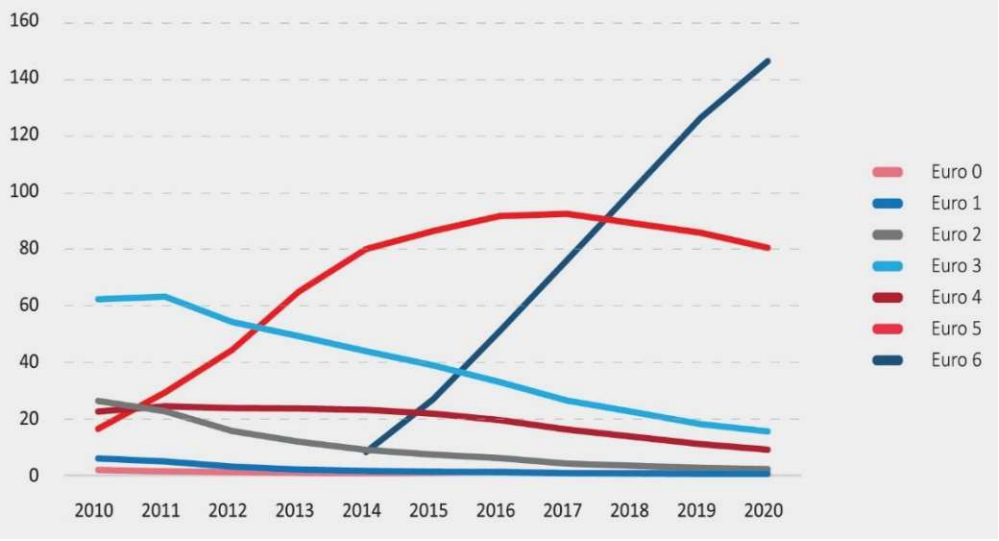


Fig.29 „ The number of heavy goods vehicles according to exhaust emission standards (in thousand) in years 2010-2020 in Poland“

Source: https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/

[78] Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+“:* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p. 80

Since 2009, the increase in the number of vehicles has been registered only by those with the emission standard Euro 5 exhaust. In 2014, the Euro 6 standard is also in force. Currently, underway to develop is the Euro 7 emission standard. (see Fig.29.)

Another direction of major changes in this industry in Poland is the rejuvenation of the truck fleet. In recent years, the share of new trucks in the fleets of Polish transport companies has increased significantly. From 2016 to 2019 it was a time of intensive investments related to quick growth of the transport market in Poland. Companies from Poland took over many orders on European routes. All this has resulted in an increased demand for trucks.[79]

„The fleet of heavy goods vehicles in Poland is mostly old in comparison with other EU member states. For instance, truck tractors up to five years old constitute 29% of the fleet in Poland, in terms of the number of vehicles, while in an average EU country it is almost 40%“ [80](see Fig.30.)

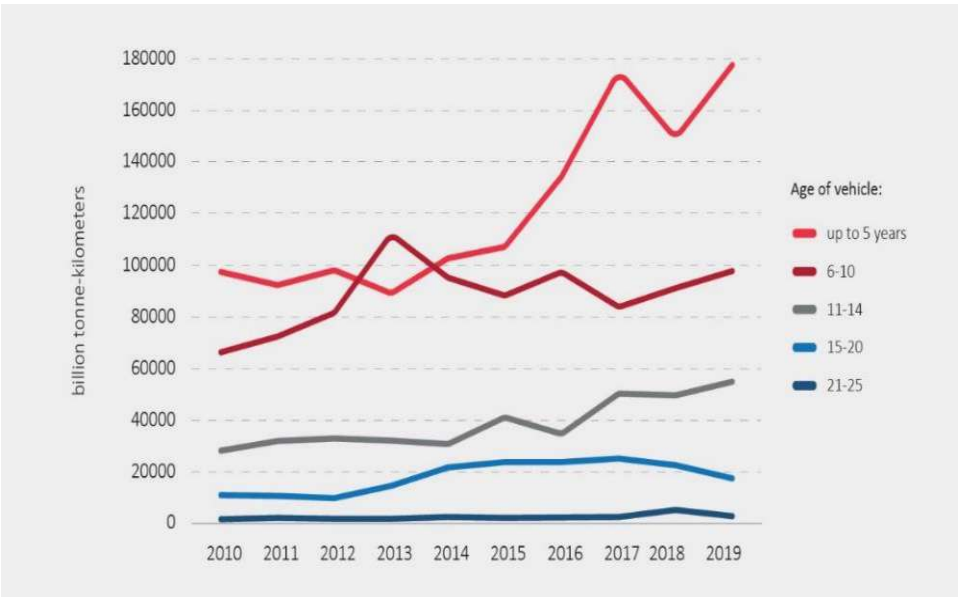


Fig.30 „ The number of carriages performed by new vehicles in years 2010-2020 in Poland“

Source: https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/

[79] Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+“:* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p. 71
[80]Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+“:* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p. 71

3.4 Challenges and trends and its effects on transport industry in Poland

In the last years in Polish road transport have been an endless series of new challenges generated both as a result of EU and national legislation and the dynamically changing geopolitical situation directly affecting the developing economic crisis. The current time is a period of big changes. They will be related to social expectations towards transport, which will translate into more and more intense regulatory activity of national, EU and international legislators. This chapter analyses the legal, social and economics factors. The analysis covers changes in national and EU law, as polish companies operate across the EU. The future of the transport market is a sign of change today. However, in order to keep the further development and prevent stagnation or recession, entrepreneurs in Poland must face many challenges. Poland, as a member of the EU, is obliged to implement recommendations that are to ensure sustainable development of the economy.

3.4.1 The "Mobility Package"

New legal regulations certainly contribute to the most important changes for the entire sector. For several years now, the revolutionary „*Mobility Package*“, which aims to adapt Polish law to EU regulations, has been widely mentioned. The first changes came into force on February 2, 2022. The European Parliament and the EU Council were working to amend several pieces of legislation that were originally intended to improve the social situation in the sector. Currently, the regulations concern the "Mobility Package" adopted by the European Parliament on April 4, 2019. The European Union expects the working conditions of drivers to be improved by raising living standards, higher salaries and safety in the workplace. These changes result in higher costs for Polish carriers and limit their access to other EU markets. Legislative and social regulations influence the road transport industry in Poland.

The Mobility Package introduces a number of major changes affecting the entire road transport sector. This set of legal provisions has introduced many transformations in the current functioning of transport companies. The most significant ones concern the recording of drivers' working time and the calculation of their salaries. One of the main assumptions of the Mobility Package is to adjust the driver's salary to the regulations of the country in which he moves. However, it imposes many new obligations on

employers in the road transport industry, in particular affecting the burden on HR and payroll departments and accounting. As a result, an increase in the cost of maintaining the enterprise. Due to legal changes, the effectiveness of operational and administrative activities may decrease. Improved working conditions for drivers, higher tax costs and increased administrative work are the main reasons.[81]

- *The Mobility Package* eliminates business travel as a form of performance of business tasks for drivers who carry out international transport
- Equal wages for drivers in the countries where they work and stay
- a change in the regulations for the performance of a transport operation involving "loading or unloading in the country of origin" by each vehicle at least once every 4 weeks
- The driver has the right to return to his/her place of residence every 4 weeks
- The regular arrival of trucks to the depot will result in more empty kilometers to meet these standards. The truck must return to its registered base every 8 weeks.
- Limit of working time at night
- The need to adapt the carrier's base to the size of the vehicle fleet. The number of parking places must correspond to 1/3 of the size of the fleet.

In the case of social regulations, the adopted changes will impose new obligations on polish companies. First to provide accommodation outside the vehicle's cabin and complicate employment rules. Polish companies were obliged to register drivers in many EU Member States, paying a salary there in accordance with the local law of the state in which transport operations are carried out. Then companies must pay social security contributions for drivers' work in this location.[82]

As part of the mobility package in the area of inspection institutions, changes are aimed at creating new entities checking the entrepreneur's activities and the intensification of inspection activities carried out by currently functioning as like the coordination of

[81] Transport.ec.europa.eu „*New rules for the EU road transport sector"*: https://transport.ec.europa.eu/transport-modes/road/mobility-package-i_en [retrieved on February 18, 2023],
[82] irumobilitypackages.org „*Mobility Package 1 in practice"*: https://www.irumobilitypackages.org/ [retrieved on February 18, 2023]

such activities between EU-28 Member States. The requirements of the mobility package are threatened with fines imposed on carriers and drivers.[83]

Starting from 2022, regulatory changes related to the *"Mobility Package"* were to hinder Polish carriers. Access to a large part of services, especially cabotage, which constitute 23% of their transport efficiency of all transport and 36% in international transport.[84]

3.4.2 The „Fit for 55 package“

Fit for 55 package presented by the European Commission will exert pressure on fast fleet development of low- and zero-emission vehicles.(see Fig. 31.) The changes include many domains, including transport. These will be changes that also affect Polish road transport companies. In accordance with new regulation's greenhouse gases emission is to be reduced by at least 55 percent until 2030 in comparison with 1990. The need to reduce emissions defined for 55 package forces switching to green energy. [85] In case of transport companies in Poland, presented proposals mean an increase in investment expenditures related to replacement of their fleet with low-emission vehicles.

[83] Irumbobilitypackages.org *„Mobility Package 1 in practice“*: https://www.irumobilitypackages.org/ [retrieved on February 18, 2023]
[84] Transport of the future (2022): *“Report on prospects for the development of road transport in Poland in 2020-2030”,* prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 28, 2023]
[85] Consilium.europa.eu „*Fit for 55*“ : https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/ [retrieved on February 20, 2023]

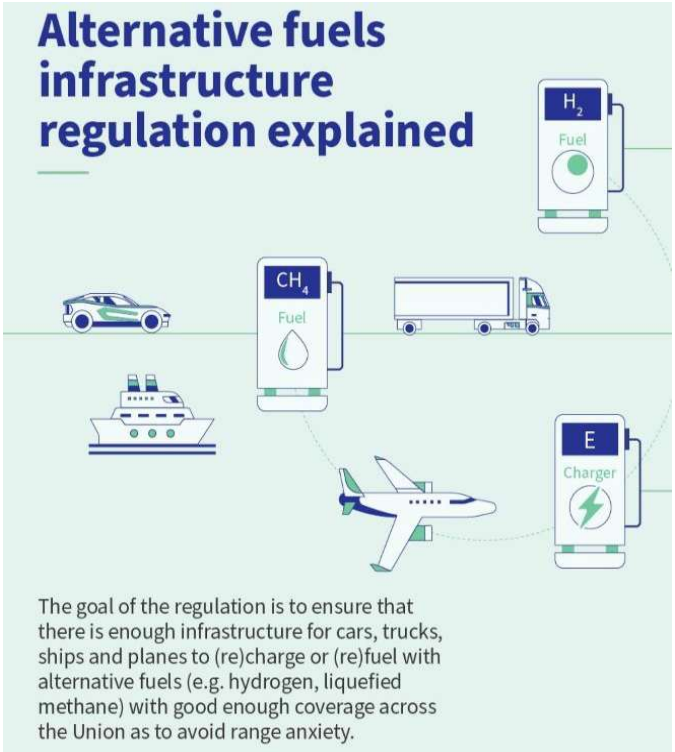


Fig.31 *„ The alternative fuels infrastructure regulation"* Source: https://www.consilium.europa.eu/en/infographics/fit-for-55-afir-alternative-fuels-infrastructure-regulation/

Alexander Klacska, CEO of the Klacska Group, Austrian fuel transport company, confirmed that: „While keeping an eye on the future, it is important to decarbonise vehicles that are already on the road. The business environment should be placed in the right conditions for alternative fuels to provide solutions".[86] All these challenges will also apply to Polish transport companies.

3.4.3 Telematics and eco-driving

According to the Mobility Package, second-generation tachographs equipped with GPS will be replaced to the trucks, which is to take place in 2025 for vehicles used in international transport, which will contribute to better visibility of a given transport in the supply chain and reduce abuses. In the near future, the presence of modern

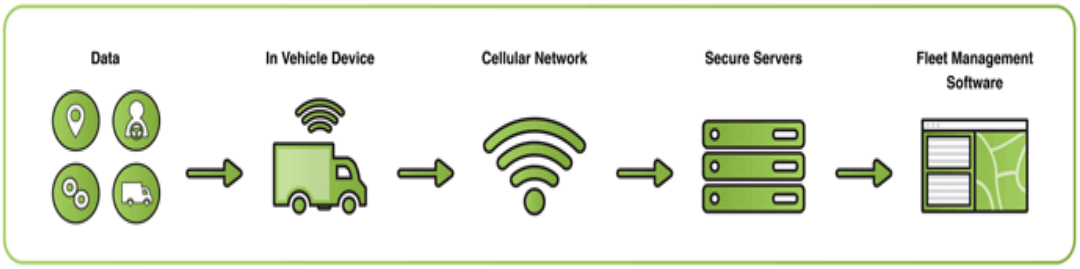
[86] Iru.org *„Fit for 55: an opportunity for the road transport industry"*(2021) : https://www.iru.org/news-resources/newsroom/fit-55-opportunity-road-transport-industry [retrieved on February 20, 2023]

technologies in the Polish transport industry will increase on a larger scale.[87] Modern telematic systems connected to GPS monitor the entire logistic process, preventing malpractices or at least effectively limiting their range.

Telematics devices in the truck are intended to monitor the status of the load, distance traveled, fuel consumption and the condition of other components and help develop the fleet management system in the enterprise. (see fig. 32). By equipping trucks with telematics, fleet department employees have the opportunity to:[88]

- Online tracking and positioning of trucks with GPS
- Detect risky driving, speeding and leaving the route. Can improve safety and reduce vehicle damage
- Vehicles can be monitored by diagnostics and then contact repair centres with proactive scheduling alerts. This allows drivers and managers to schedule maintenance
- Monitor the cargo weight and prevent unauthorized cargo loading or unloading
- Monitoring the route and location of vehicles using GPS navigation

This information can be used in real-time analysis to improve overall driver safety, and reduce costs and improve performance for commercial vehicles.



Fig,32 „ *The fleet management software*“ source: https://www.teletracnavman.co.uk/fleet-management-software/telematics/resources/what-is-telematics

As fuel consumption in transport companies is one of the fleets' most pressing costs, reducing excessive fuel consumption is critical to the overall efficiency of the business. The transport sector is also focusing more and more on eco-driving. Transport companies have the opportunity to introduce eco-driving training fort ruck drivers.

[87]Fleet.vdo.com https://www.fleet.vdo.com/eu-mobility-package-1/ [retrieved on February 20, 2023]

[88] Teletracnavman.co.uk „*What is telematics?“* (2023): https://www.teletracnavman.co.uk/fleet-management-software/telematics/resources/what-is-telematics [retrieved on February 20, 2023]

„*Ecodriving* is a way of driving in which fuel consumption and exhaust gas emissions are kept to a minimum“[89]. *Eco-driving* is behavior while driving a motor vehicle, the aim of which is to optimize the overall driving style by adjusting it to an optimal and neutral one. (see Fig. 33). Proper training in eco-driving leads to a reduction in the use of aggressive acceleration and braking. It allows to better control the right speed of the truck on the road. Eco-Drive systems reduce fuel costs and protect vehicles from damage caused by improper driving, and motivate drivers to improve their skills. *Eco-driving* is also supported by telematics tools. The module in such a device makes it possible to analyse fuel consumption not only of the entire fleet, but also of a single driver. It counts the economic revolutions, the length of the stop with the engine running or exceeding the recommended speed. Thanks to this, a special ranking of drivers can be created, and then the carrier knows who drives the most economically, as well as in which areas there are reserves and what can be improved.[90] Even a small reduction in fuel consumption is associated with significant savings if we relate it to several dozen or several hundred truck sets.

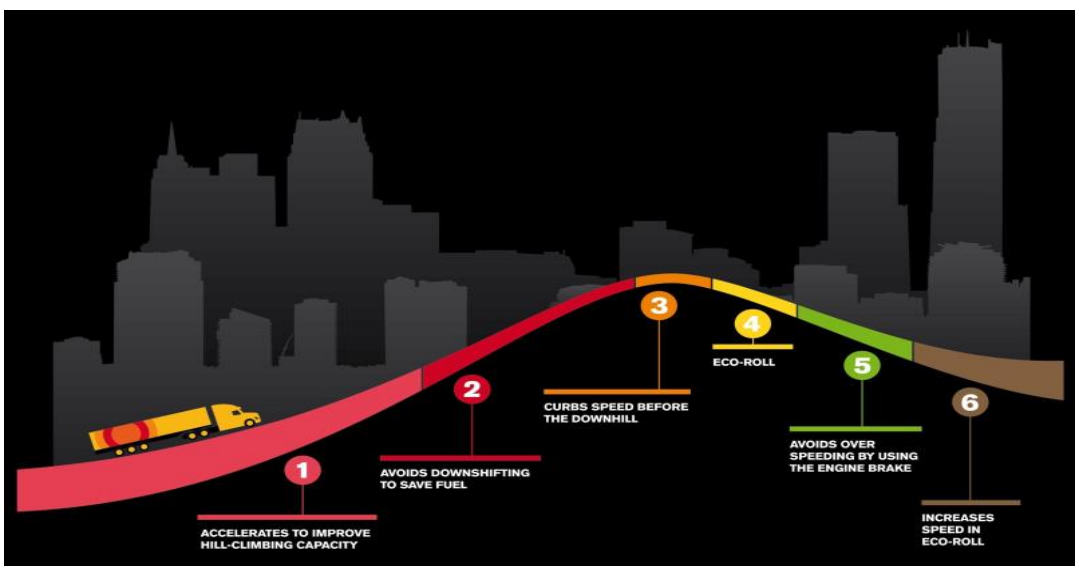


Fig.33 „ *Elements of eco-driving in the driver's work“* source: https://www.greencarcongress.com/2022/03/20220316-itorque.html

Truck suppliers on the Polish market are increasingly offering eco-driving training and systems to the end users.

[89] Trimbletl.com „*What is eco-driving*?“: https://www.trimbletl.com/glossary_term/what-is-eco-driving/ [retrieved on February 20, 2023]
[90] Truckingresearch.org „*The Role of Truck Drivers in Sustainability“:* https://truckingresearch.org/sustainable-driving-practices/ [retrieved on February 20, 2023]

Being aware of the rising costs, Polish transport companies are looking for solutions to reduce fuel consumption. We should also remember about the effect of scale and the fact that such a solution can bring hundreds of thousands of euros of savings per year in a big fleet.

One of the Polish transport companies „Daw-Trans“ presented the following results of fuel consumtion tests using eco-driving methods. The company has 70 Mercedes-Benz trucks in its fleet. In the first quarter of 2022, „Daw-Trans“ saved 7.738 liters of fuel in Actros 1845 vehicles (with a standard of approx. 23.6 l.) and 3.514 liters in Actros 1848 (with a standard of approx. 24 l.) compared to the same period in 2021. In total, 11.252 liters of fuel were saved in one quarter. With the average fuel price in Q1 2022 in Poland amounting to 1.65€/l. The entire cost of eco-driving savings for this company was 18.565,8 € in one quarter.[91]

Fig.34 *„ Daw-Trans company from Poland and Mercedes-Benz Actros truck tractor“* source: https://truckslog.pl/aktualnosci/bezpieczenstwo/mercedes-benz-skuteczny-system-oszczedzania-actros-fleetboard-i-szkolenia/

Systems supporting economical driving at Daw-Trans are Predictive Powertrain Control (PPC) and aligned with the Fleetboard telematics system and the Uptime service.(see Fig.34.) Fleet board's telematics system shows drivers how they are driving. This system allows the driver to check whether and how many times he has applied the brake, whether he used the rolling mode when he had the PPC system

[91] Truckslog.pl „*Skuteczny system oszczędzania – Actros, Fleetboard i szkolenia“:* https://truckslog.pl/aktualnosci/bezpieczenstwo/mercedes-benz-skuteczny-system-oszczedzania-actros-fleetboard-i-szkolenia/ [retrieved on February 21, 2023]

turned on. The car itself, even packed with technology, will not achieve satisfactory results, which is why it is so important to train drivers and constantly improve their skills.[92]

3.4.4 Driver shortages in Poland

Demographics affects road transport in Poland. TSL sector experts warn that the situation is critical and requires systemic solutions. More and more economic cases are accumulating, such as the effects of a pandemic or the war in Ukraine. Staff shortages are an increasingly noticeable problem for Polish transport companies.

Very good results from the labour market indicate that the unemployment rate in Poland is currently 2.9% in December 2022 and is one of the lowest in 30 years.(see Fig.35.) It is also the second lowest in the EU, after the Czech Republic.[93] This means significant difficulties in finding employees in certain professions, such as truck drivers.

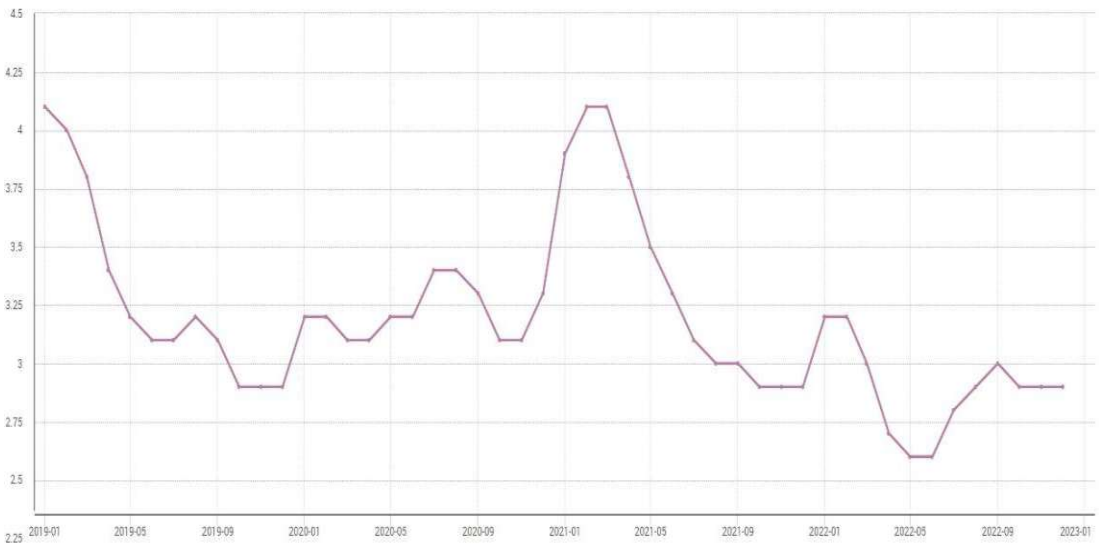


Fig. 35 *„ Unemployment in Poland 2019-2022– monthly data“* Source: Eurostat

[92] Truckslog.pl *„Skuteczny system oszczędzania – Actros, Fleetboard i szkolenia“:* https://truckslog.pl/aktualnosci/bezpieczenstwo/mercedes-benz-skuteczny-system-oszczedzania-actros-fleetboard-i-szkolenia/ [retrieved on February 21, 2023]

[93] Eurostat https://ec.europa.eu/eurostat/databrowser/view/UNE_RT_M__custom_5119001/default/line?lang=en [retrieved on February 20, 2023]

The driver's tasks in the road transport industry include delivering loads to designated locations, according to a fixed route and schedule, using a truck, often with a trailer. Their duties also include caring about the vehicle and the goods transported, maintaining of the proper documentation.[94] Drivers in international transport spend a lot of time away from home. Moving around different countries, even within the European Union, they must know local regulations and are responsible for high-value goods. „The requirements and working conditions encountered by international drivers make it increasingly hard to recruit new, properly qualified employees".[95]

In recent years, as in many professions, the working model has changed in the transport industry. The "4+1" work system model was common in Poland over 20 years ago. It means four weeks on the road, one week at home. The "3+1" system slowly became popular since 2004, when Poland joined the EU. In the last ten years, the sector started to switch to the "2+1" system in Poland. We are currently observing further changes in these business models, an increasing number of drivers want to work in the "2+2" system. Employees such as truck drivers also expect to spend more time at home.[96]

In 2015 in Poland, the shortage was estimated at around 100.000-110.000 drivers, i.e. more than 15% of the total supply, estimated at 600.000-650.000 drivers. In year 2022, the shortage of drivers in Poland with the desired skills will most likely increase to about 200,000 drivers.[97] (see Fig.36.)

[94] Indeed.com „*Truck Driver Job Description: Top Duties and Qualifications"* : https://www.indeed.com/hire/job-description/truck-driver [retrieved on February 22, 2023]
[95] Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) „Road transport in Poland 2021+": https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p. 86
[96] Ibidem p.86
[97] Transport of the future (2022): *"Report on prospects for the development of road transport in Poland in 2020-2030",* prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 28, 2023]

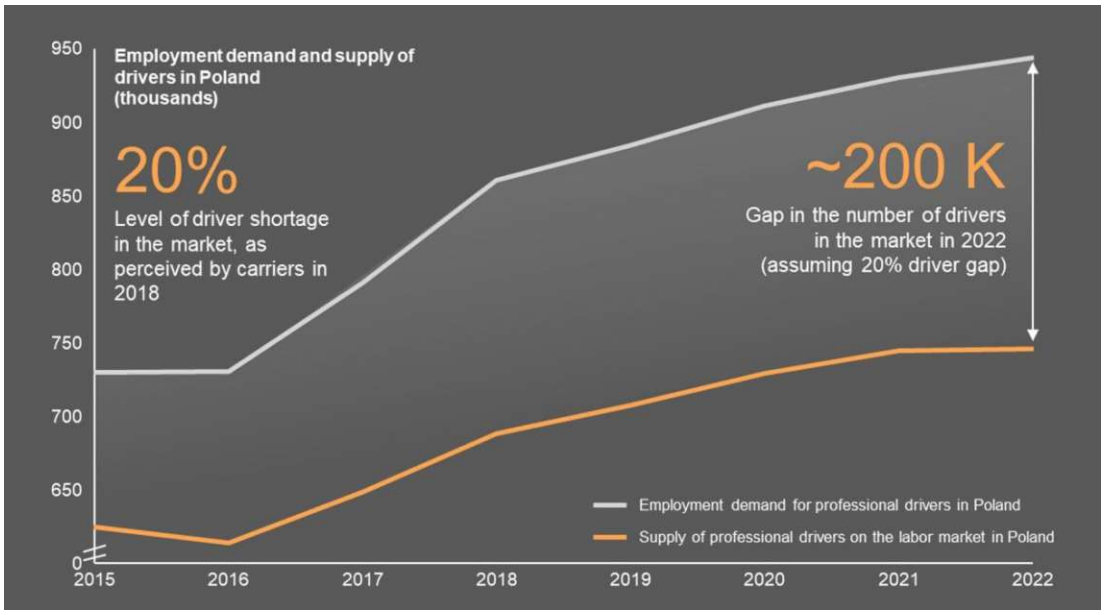


Fig.36 „ *Employment demand and supply of drivers in Poland 2015-2022"* Source: https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/

According to Eurostat data including transport domestic and international, 34.6% of drivers in Poland are at least 50 years old and only 6.5% drivers under 30 years old.[98]The older group is overrepresented in this profession. Up to 10% of current drivers may leave the market due to reaching retirement age by the end of 2028. It is estimated that around 25,000 employees leave the driving profession every year.

Truck drivers currently have a high average age. This is also the case in other industries and this trend will continue to grow. Changes in the drivers' labour market in Poland are mainly caused by low attractiveness of the driver's profession and demographic factors – i.e. ageing population and migrations.(see Fig.37.)

[98] Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p. 87

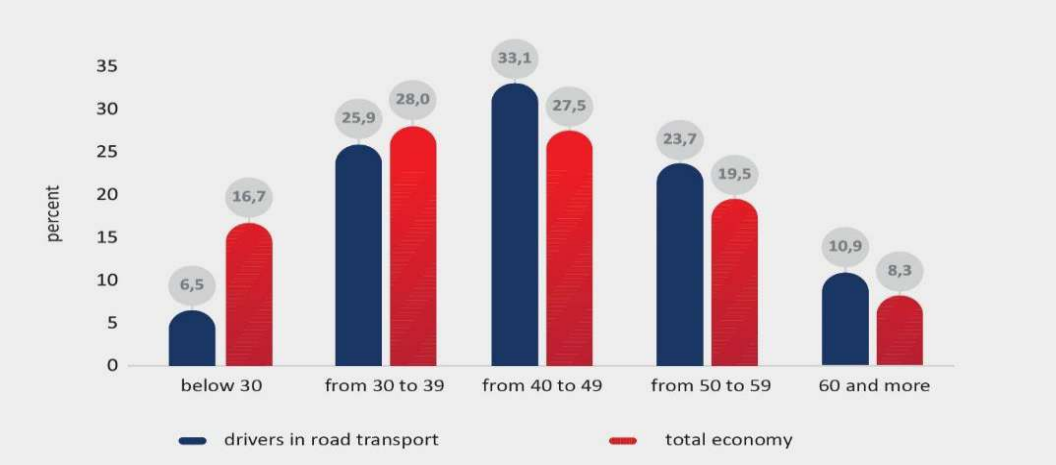


Fig.37 „ *The age structure of employment in road transport and in economy in general – Poland*" source: Inelo and Eurostat

With an optimal employment rate of 1.5 full-time drivers per vehicle, even large companies in Poland oscillate at a rate of 1.1 drivers per vehicle, and in the case of smaller companies this indicator is 0.9 drivers per vehicle.[99]

A characteristic indicator for developing countries, including Poland, is a decrease in the number of births. It is forecasted that in Poland by 2050 the number of people will decrease by 11% to around 34 million people.(see Fig.38.)

It will be also depend on the number of emigrants who come to Poland, for example, because of the war in Ukraine.[100]

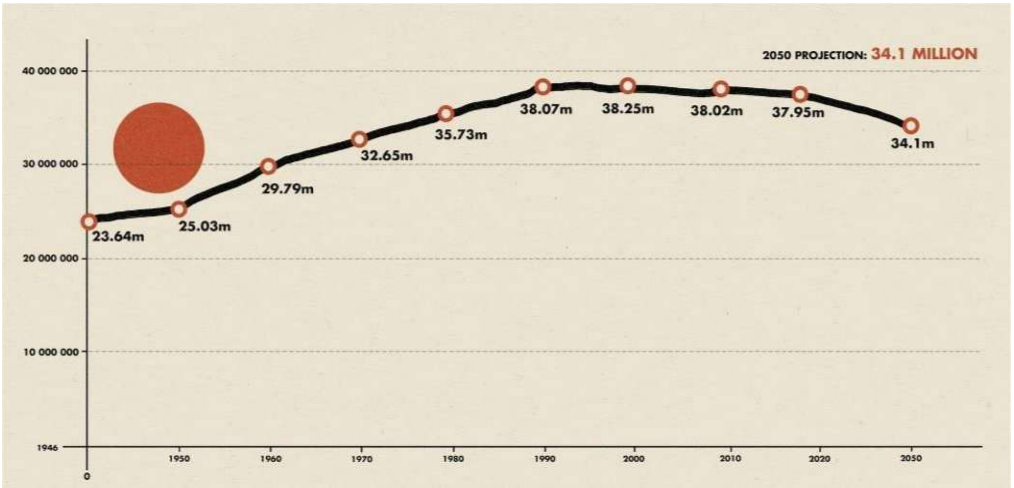


Fig.38 „ *Poland`s change in population 1946-2050*" source: https://balkaninsight.com/2021/04/01/polands-population-imponderables/

[99] Trans.eu https://www.trans.eu/pl/landing/raport-transportowy-tfc-2023/ [retrieved on February 25, 2023]

[100] Eurostat „*Statistics on regional population projections*" Eurostat 2010-2050 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Statistics_on_regional_population_projections

One of the characteristic data is that the road transport industry in Poland is dominated by the male gender, and the share of the female gender among people with qualifications is only slightly above 0.4%. The lack of interest of women in this industry also limits the recruitment of new employees.(see Fig.39.)

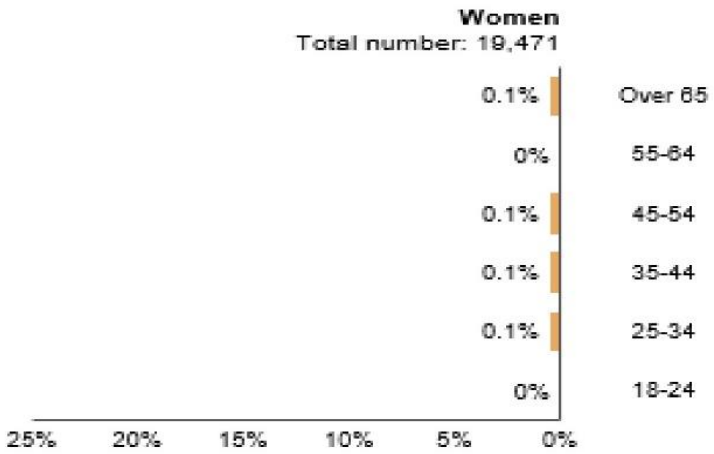


Fig. 39 *„ Age structure of women with truck driver licenses in Poland, 2016* source: General Inspectorate of Road Transport in Poland

In the period of five years, over 100,000 drivers from outside the EU joined the polish market, allowing the road transport sector to maintain the fast pace of development. The increase in the number of immigrants is slowing down, which may hinder recruitment of new employees.

Most foreign drivers come to Poland from Ukraine - as many as 75% ; the second are citizens of Belarus – 20% , and third - of Russia and Moldova - 2 %. The next places are citizens of Georgia and Kazakhstan – 1 %. Poland is attractive in terms of earnings for these workers. The advantage of working in Poland is cultural proximity and less language barriers for employees from Eastern Europe.

Driver attestations for nationals of non-EU countries, authorizing them to work as drivers for Polish companies, areissued by the General Inspectorate of Road Transport. At the end of 2021, the number of valid attestations of this kind was 133,000.[101] (see Fig.40.)

[101] Morawski I., Defratyka I, Laszkowski , Kalisiak A. (2022) *„Road transport in Poland 2021+ ":* https://tlp.org.pl/raport-transport-drogowy-w-polsce-2021-eng/ [retrieved on January 28, 2023], p. 88

This trend may change in 2022-2023 because many Ukrainian drivers employed in Poland have returned to Ukraine to fight in the ongoing war. There is no data yet to show how strong these changes are. There is no relevant data, how many Ukrainian workers will leave and how many new ones will come to Poland, but carriers also have recruitment in others directions, including Asian countries such as Uzbekistan, India, Nepal, the Philippines and Vietnam. The difference in wages for drivers between Poland and Asian countries is significant.

„The challenge of recruiting drivers from Asian countries is represented by significant cultural differences, differences in driving behavior across countries and varying attitudes of workers towards work. Administrative procedures are also a barrier".[102]

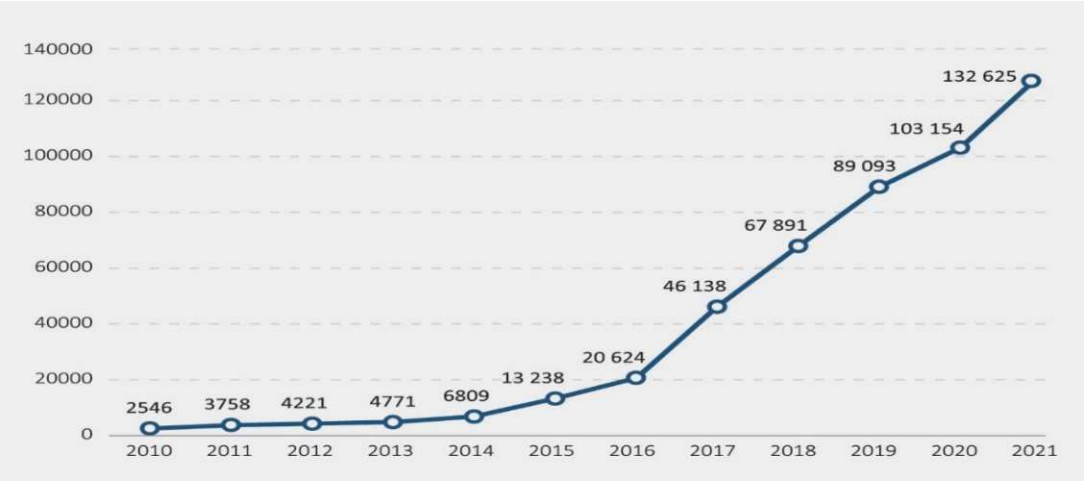


Fig.40 *„ The total number of driver attestations issued by the GIRT in Poland in years 2010-2021"* source: General Inspectorate of Road Transport in Poland

The driver's position and the road transport industry are not considered attractive. This job has many disadvantages, such as separation from family, control of working time and lack of social infrastructure when traveling. Just one oft the main social factors in driver shortages in Poland are increased monitoring of employee performance. GPS tracking devices can improve employee productivity but also create stress in the future. The workers will have to adapt to new technologies. Especially looking at the age

[102] Transport of the future (2022): *"Report on prospects for the development of road transport in Poland in 2020-2030*", prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 28, 2023]

structure of drivers in Poland, new technologies are problematic to use them efficiently.[103]

„According to estimates of the Polish statistical office From 2019 to 2025, about 400,000 people will come to Poland, and by 2050, another 1.8 million people will have come to Poland".[104] However, the data will be completely different. The war in Ukraine significantly changes these estimates. The Polish immigration office reports that since the beginning of the war on February 24, 2022, about 2 million Ukrainian citizens have come to Poland and stayed there.[105] All this shows that Poland has become a destination country for many emigrants. This trend will certainly continue.

[103] Christidis P., Navajas E., Brons M., Schade B., Mongeli I, Soria A. (2014): „*Future employment in transport. Analysis of labour supply and demand",* Publications Office of the European Union, Luxembourg p.15

[104] Transport of the future (2022): *"Report on prospects for the development of road transport in Poland in 2020-2030",* prepared by PwC and in substantive cooperation with the Transport and Logistics Poland Employers` Association, Warsaw https://www.pwc.pl/en/publikacje/2019/transport-of-the-future-prospects-for-the-development-of-road-transport-in-poland-2020-2030.html [retrieved on January 28, 2023]

[105] Stat.gov.pl *Statistics Poland* https://stat.gov.pl/en/ [retrieved on February 10, 2023]

4. Main problem identification

The Polish transport industry, despite its strong and consolidated position on the European market, is struggling with many problems that have a direct impact on the condition of the domestic economy. The profitability of small carriers may be particularly difficult to maintain in Poland, which is the result of high competition, relatively low bargaining power, low customer diversification, lower efficiency, regulations forcing investment in modern technologies, high share of fixed costs and greater vulnerability to fines or fines. Although the TSL industry recovered from the pandemic reality surprisingly quickly, the global recession will be a much more serious for it. For many reasons, transport in the coming years will be more difficult. Rising fuel prices are just one of several factors taken into account in these pessimistic forecasts. In Poland, the main brake on the TSL industry is high inflation - in 2022 it amounted to 13.2%, caused primarily by high prices of raw materials, fuels and energy.[106] These goods started to become more expensive during the pandemic, but the war in Ukraine significantly accelerated and strengthened this trend. The operating costs of companies will also increase, and this will increase the risk of payment backlogs with contractors, which may result in a loss of financial liquidity for many carriers. The imposition of sanctions on Russia and the strong condemnation of aggression against Ukraine by the world authorities resulted in the fact that transport to the east has been practically completely limited, which also directly affects Polish transport companies. The carriers were forced to look for other markets and creating additional competition for the entities already present there.

The coming years will be particularly demanding for the TSL industry in Poland. Many companies are forced to take quick and strategic actions, probably mainly to survive.

The fundamental regulatory changes introduced at the level of the EU and the long-term deficit of professional drivers were compounded by macroeconomic challenges. In order for transport companies to maintain any profitability, prices for services must take into account the current dynamics of fuel and means of transport prices, as well as the increase in salaries in the industry. An important aspect is also increases in the case of leasing and loans, as well as the prices of new cars. At the end of September

[106] Economy-finance.ec.europa.eu „*The latest macroeconomic forecast for Poland*“ (2023): https://economy-finance.ec.europa.eu/economic-surveillance-eu-economies/poland/economic-forecast-poland_en [retrieved on March 15, 2023]

2022, the National Debt Register included 28,139 companies from the TSL industry. The overall debt of this sector currently stands at 1.13 billion polish zloty (ca. 250 mEuro). For comparison, in 2018 it amounted to 925 m polish zloty (ca.205 mEuro). According to KRD, about 880 m polish zloty (ca.195 mEuro) of this amount is arrears in road transport.[107]

The long-term problem is the lack of qualified staff, specialists, managers, and especially drivers. In addition to staffing problems, there is a rapid increase in costs in many areas - salaries, fuel or leasing. High demand for transport and structural staff shortages meant that drivers' salaries have been growing faster than the average in the industry for years.[108] The war in Ukraine has an even stronger impact on the cost of fuel. The price of oil increased to over 130 USD per barrel in March 2022, and the price of gas doubled in one month, i.e. from February 2022 to March 2022.[109]

Difficulties among companies in Poland are the instability and dynamics of the legal environment in Europe and national regulations. The regulations on minimum wages introduced in the EU countries and the Mobility Package may serve as an example. Legal changes introduced by the Mobility Package - especially those regarding salaries and delegation of work.

Poland is among the leaders of transport companies serving British routes, adapting procedures to *Brexit* have become not only highly important, but also problematic. This is primarily about introducing the obligation of customs clearance. Poland, as one of the largest carriers in Europe, may face more activity of cheaper, foreign carriers.

The whole of this business environment and the specificity of the transport industry mean that transport companies in Poland will have to answer the question of how to prepare for this difficult time and survive in the probable time of crisis. The research should be carried out to show us the current state of knowledge of decision-makers in transport companies. The results and analysis of this survey in the form of a questionnaire can be used to create a guide for interested parties.

[107] Krd.pl „*Raport from the National Debt Register*“: https://en.krd.pl/#_ga=2.265349837.374942708.1688300994-1336099751.1688300994 [retrieved on February 10, 2023]
[108] Stat.gov.pl „*Statistics Poland*“ : https://stat.gov.pl/en/ [retrieved on February 10, 2023]
[109] Oilprice.com „*Oil Price Charts*“: https://oilprice.com/oil-price-charts/ [retrieved on March 15, 2023]

The survey and analysis of the results allow to learn about the current situation and then indicate proposed solutions. It may be interesting to know whether transport companies think about the future of their operations and whether they correctly diagnose threats in the next 5 years. After analyzing the results, it will be possible to determine whether transport companies have the ability to meet the needs of contractors, market requirements and the ongoing digitization of the industry. Developing such results and identifying solutions can help future decision-makers adapt efficiently and quickly to the changing environment.

4.1 Questionnaire

This method consists in obtaining data by asking questions on the basis of a specially prepared questionnaire - obtaining answers by the interviewer from respondents selected on the basis of appropriately selected research samples.(see Appendix 1)

4.2 Procedure for preparing the questionnaire

The aim of this study was to identify the most important trends and challenges based on interviews with Polish representatives of transport companies. The questions have been structured to be clear to the decision makers. The study was to determine how new business models are based on technologies, easily and quickly revolutionize the market. The questionnaire was also supposed to answer the question of what is the knowledge of transport companies about new technologies. Especially important was the perspective of the next five years and the consequences of the changes that transport companies will have. The questions also gave an answer to the companies predictions regarding their financial condition in the near future.

This study showed what concerns transport companies have in connection with the dynamic changes taking place on the Polish and European markets. It was also crucial to determine the level of preparation and knowledge of transport companies in Poland for future changes and challenges currently taking place in this industry. 26 questions divided into three parts.

4.3 Selection of experts

The questionnaire was conducted on April 3-17, 2023, using the CAWI method, and 104 working people took part in the TSL industry. „The CAWI research methodology is an interview conducted via an Internet channel. The respondent receives and completes the survey provided to them through the same online channel".[110] The results of the study are presented in the following chapters. The addressees were people from key positions in transport and logistics companies in Poland. For professionals, it was important to have a real impact on future decisions in TSL companies

[110]Kamburov-Niepewna U. (2021): „*CAWI Method – Where Did the Popularity of Online Surveys Come From?"* https://www.startquestion.com/blog/cawi-method-where-did-the-popularity-of-online-surveys-come-from/ [retrieved on Mai 15, 2023]

5. Results of the survey

After collecting all the surveys, the results were compiled and presented graphically below in the chapter in a structured form and with analysis.

5.1 Research analysis and main findings

The road transport is also very sensitive to any challenges and barriers the future may bring. The changes taking place in the industry are very dynamic and can have severe consequences. Any crisis or armed conflict can cause a drastic increase in costs and immobilizing the vehicle fleet. The pandemic period has shown how vulnerable road transport and supply chains are to unforeseen events and challenges.

The majority of the participants in the study were men's. The share of women in key positions of transport companies is small and amounts to only 8%. They hold executive positions and are between mostly 40 and 49 years old. In the study, the vast majority were people with extensive experience and key positions, such as the owner. They have a real impact on creating business and changes in the company.(see Fig.41., Fig.42. and Fig.43.) The age is of these people is the most productive.

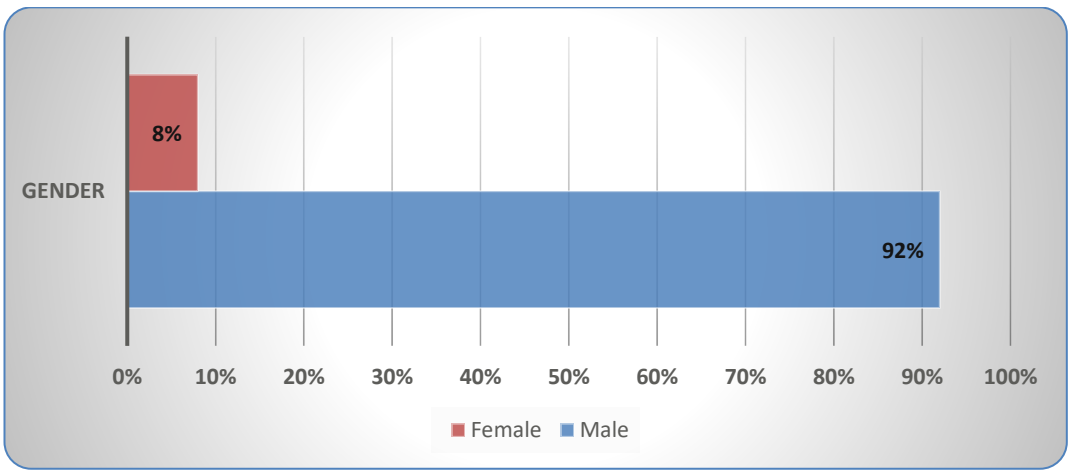


Fig.41 - Question no. 1, own research.

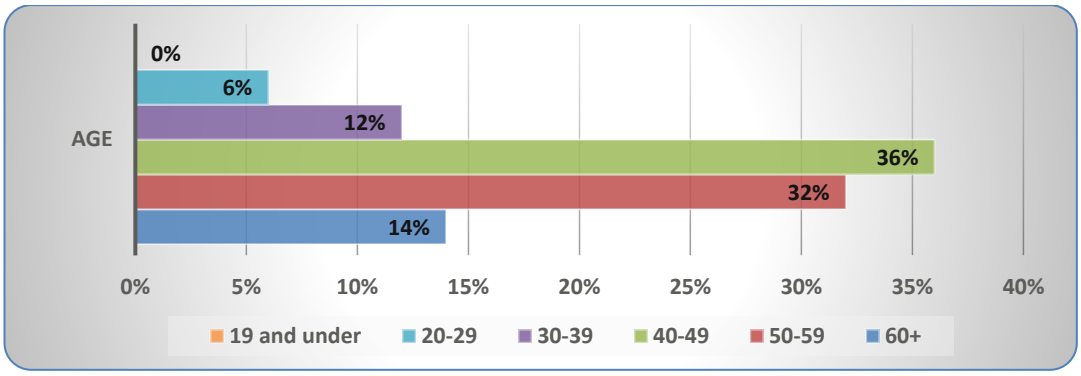


Fig.42 – Question no 2, own research

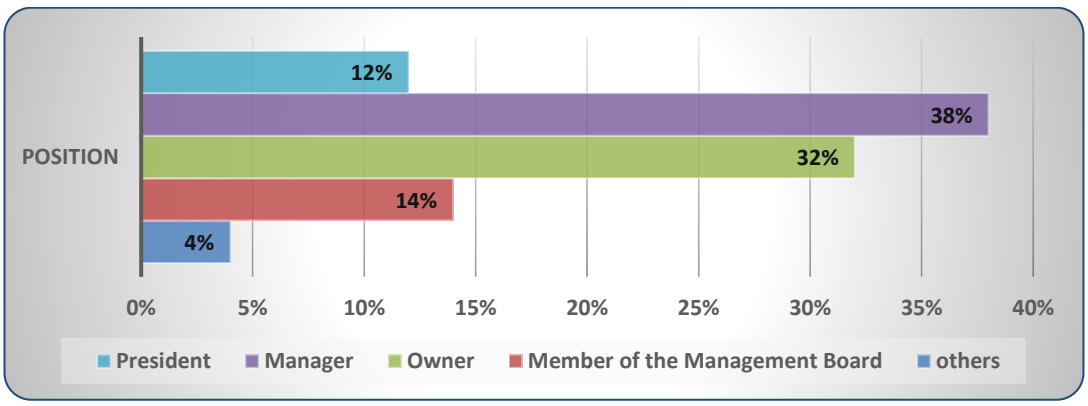


Fig.43 – Question no 3, own research

67% of the companies surveyed have a fleet of 50 to 200 vehicles. In Poland, these are already significant companies in the medium-sized transport industry. The survey was addressed to medium-sized transport companies in Poland. 28% of respondents are in the group of over 100 vehicles in the fleet. (see Fig.44.)

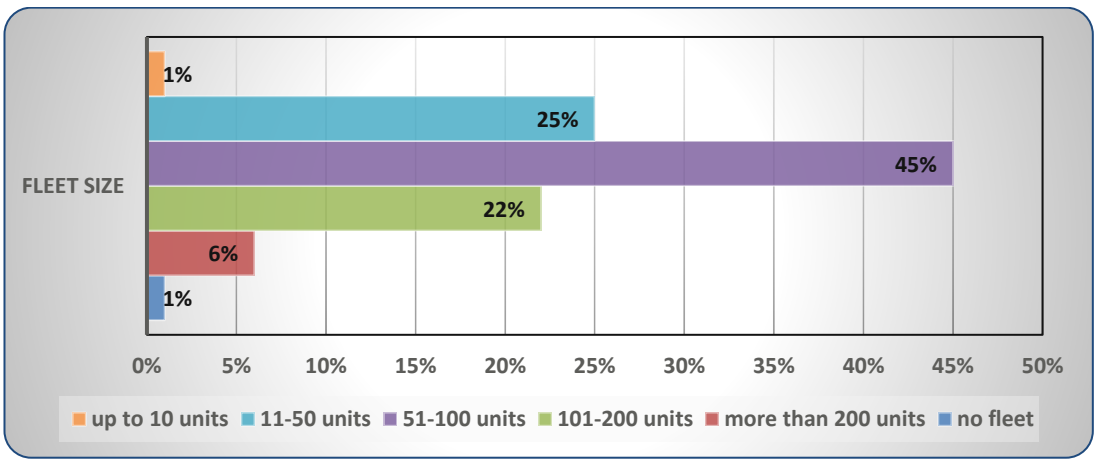


Fig. 44 Question no 4, own research

90% of companies transport FTL and LTL loads. Only 10% provide special transport. They mostly serve the final customer, i.e. they have orders directly from the final customer. Only 8% of companies are fully dependent on subcontractors. (see Fig.45. and Fig.46.)

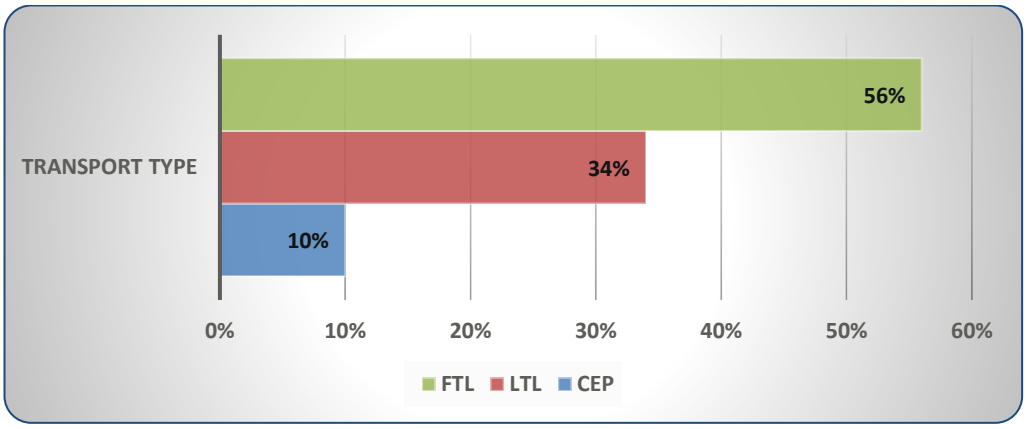


Fig.45 Question no 5, own research

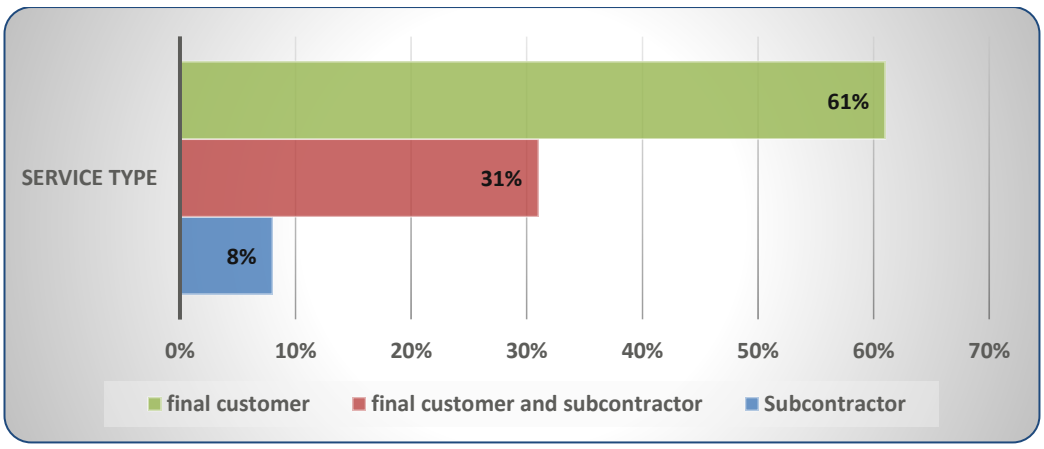


Fig.46 Question no 6, own research

As many as 78% of companies are only international transports and 90% are a combination of domestic ones. Just 10% of companies are focused only on domestic transport. This shows that the Polish transport industry is strongly focused on international transport and provide international services. This means that any changes in the international environment will affect the operations of these companies.

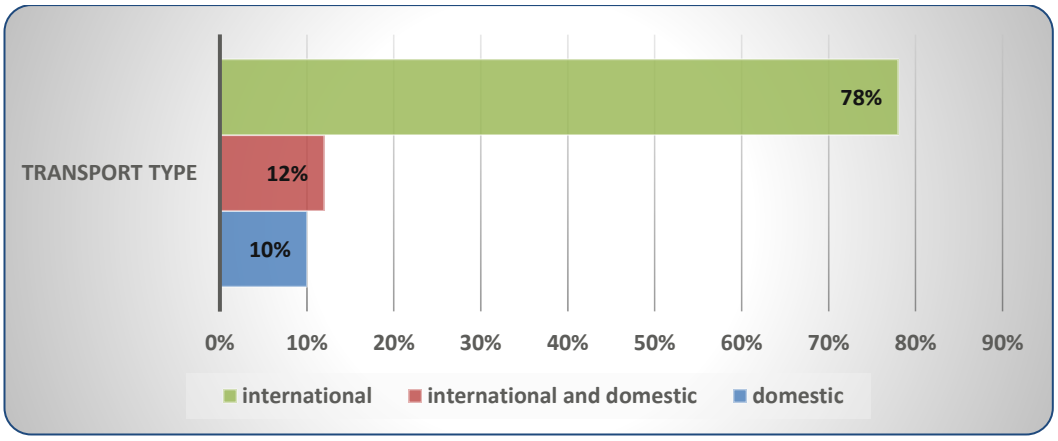


Fig.47 Question no 7, own research

The respondents are almost evenly divided in their decision to open a company in the transport industry in the current economic environment. 53% answered that they would probably or definitely would open a transport company at present.

The rest, i.e. 47%, would not decide or probably would not want to open a company in the current economic conditions. This shows how uncertain and difficult this business can be now. (see Fig.48.)

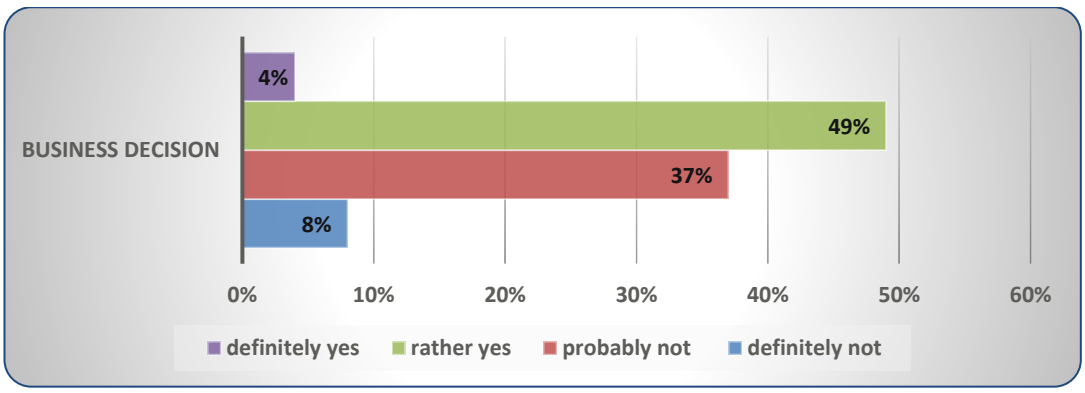


Fig. 48 Question no 8, own research

However, the vast majority of respondents (78%) do activities to improve the skills and quality of their staff. Every fifth company (21%) does not undertake any activities in the area of staff development. The training system is based on internal practices in companies. Polish companies are constantly looking for employees, almost all respondents (92%) had open recruitments in the last 6 months. This only confirms how low unemployment is in Poland. (see Fig.48. and Fig.49.)

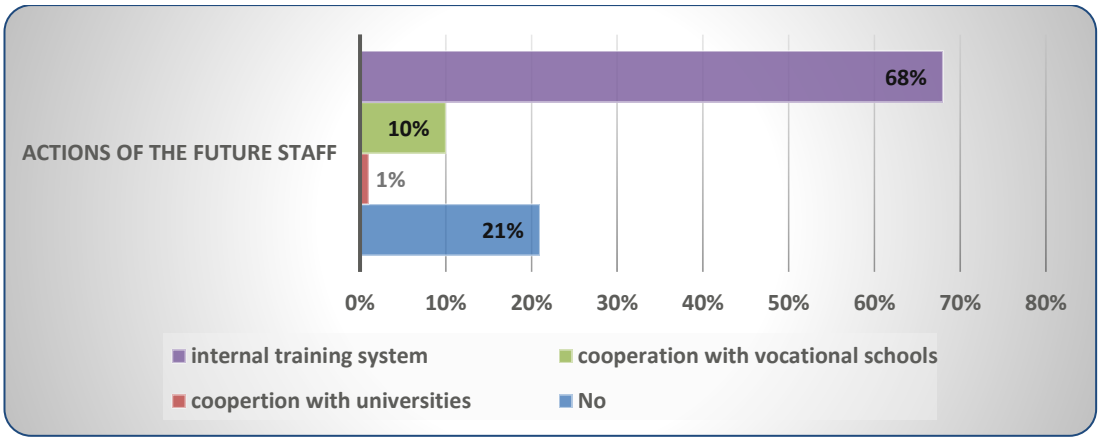


Fig. 49 Question no 9, own research

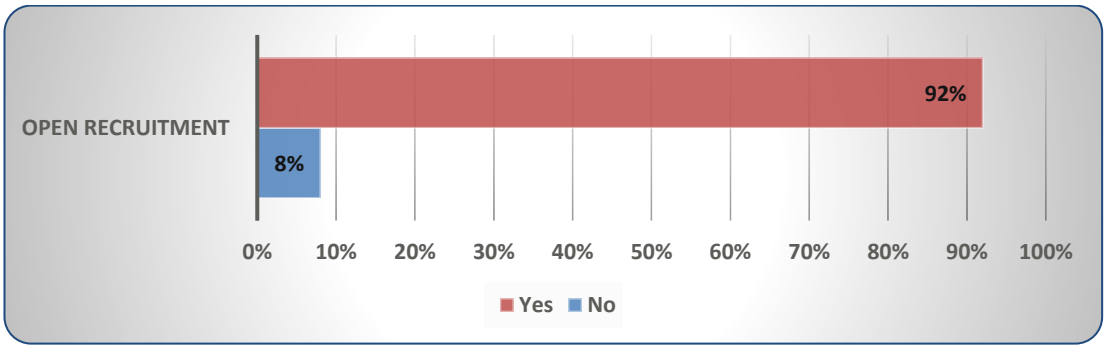


Fig. 50 Question no 10, own research

A key challenge that companies have to face over the next five years is the lack of workers. Transport companies indicated the lack of drivers as their biggest challenge and problem. This problem was rated 8,9 on a scale of 1 to 10. This shows how much concern there is among transport companies about access to drivers. Problems related to low accessibility to drivers will be deepend in the coming years, and companies are already aware of this. This is influenced by demographic and socio-cultural changes in Poland, but also in Europe. As the second-biggest risk to their business, respondents indicate the Mobility Package, which was rated as average at 8,0. The Mobility Package will force companies to operate at higher costs. EU regulations (7,8) and competition from Asian or Eastern European (5,6) companies were ranked next in the risk scale. Polish companies are less afraid of competition from companies from other regions of the world. They have the least fear in relation to the likelihood of war, it was only rated at 2,1. (see Fig.51.)

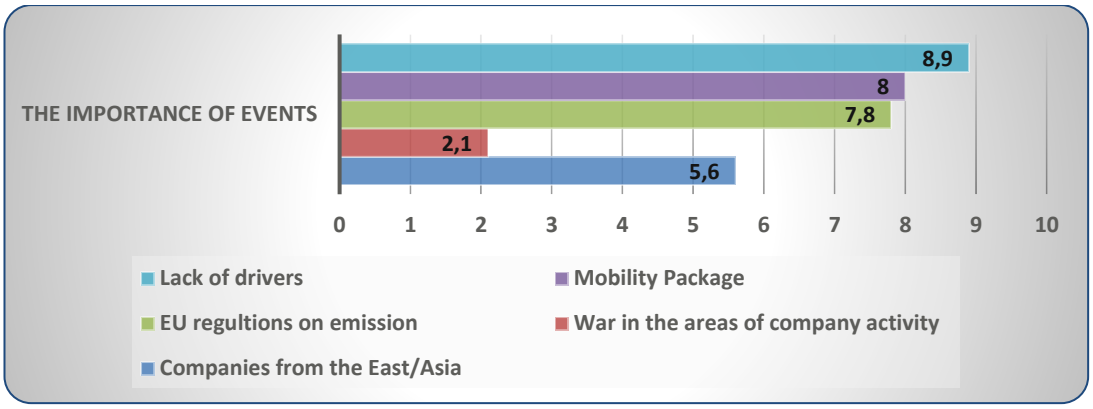


Fig.51 Question no 11, own research

Polish companies indicate the purchase of new vehicles (79%), digitization of processes (57%) and improving the competence of employees (50%) as the main areas for investment. The next place was occupied by investments related to the warehouse (27%). This shows that they are focused on traditional investments in key areas for the daily operation of the company. (see Fig.52.)

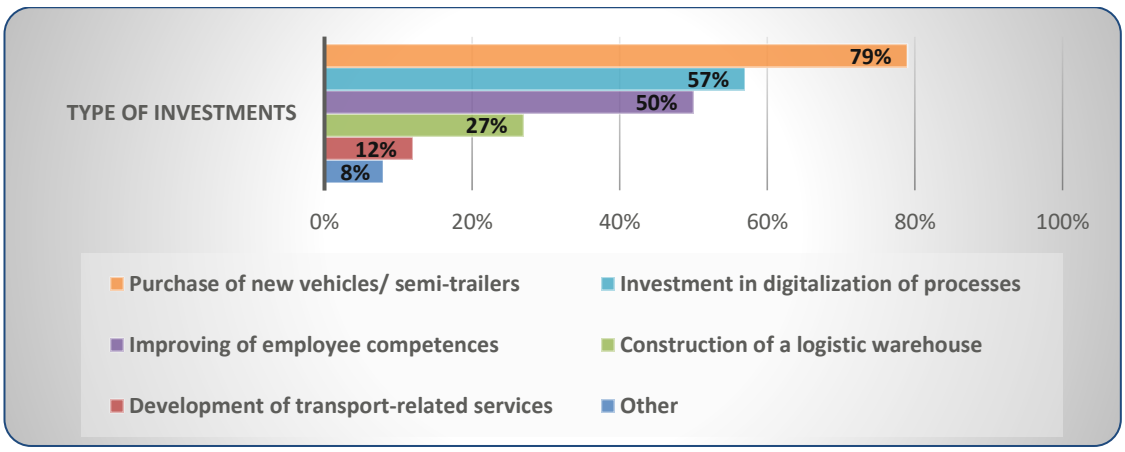


Fig.52 Question no 12, own research

The activities of transport companies will continue despite higher costs related to the Mobility Package(73%). Only 12% of companies plan to register activities outside Poland. The result of the study shows that Polish companies are not open to changes and business flexibility. (see Fig.53.)

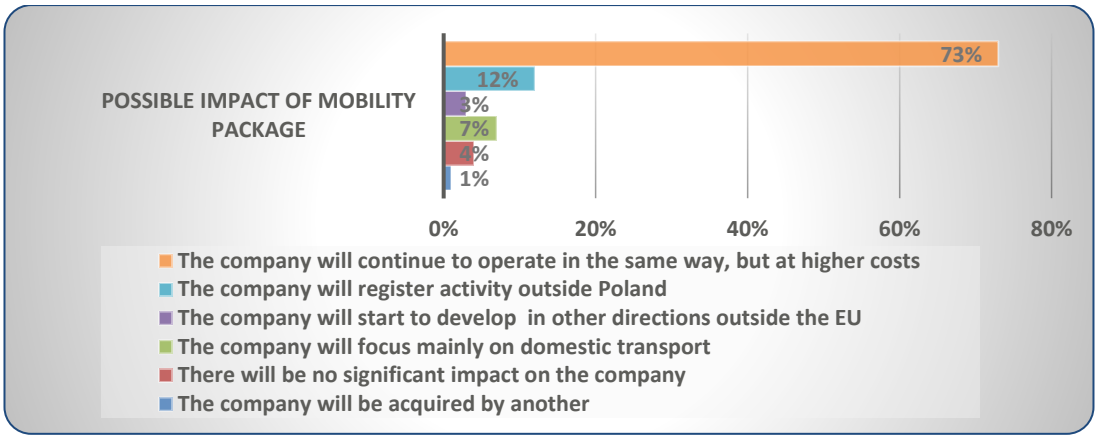


Fig.53 Question no 13, own research

Problems with the availability of drivers and high operating costs of the company cause that even for 38% of companies, trucks remain parked in the range of 6-20% of the entire fleet. More than half of the companies (54%) now have between 0 and 5% of their trucks parked. Mid and big-size companies can afford to have a few percent of their fleet parked. Small businesses are under a lot of pressure to keep all trucks moving. It is worrying that as many as 5% of companies have parked trucks in the range of 21%-40% of their fleet. Parked vehicles generate high costs for the company, which can lead to bankruptcy.(see Fig.54.)

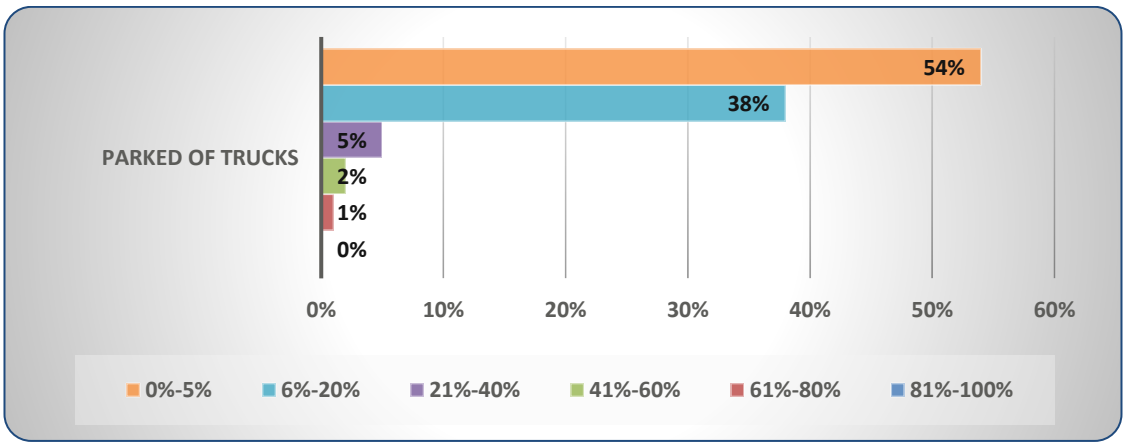


Fig.54 Question no 14, own research

In the context of new technologies, companies believe that the most likely in the next five years will be the use of developed telematics and live tracking (78%) and electric vehicles (72%). In third place with a large share of 34% were delivery drones. Only 8% of respondents believe that fully autonomous vehicles will be used in the near future. (see Fig.55.)

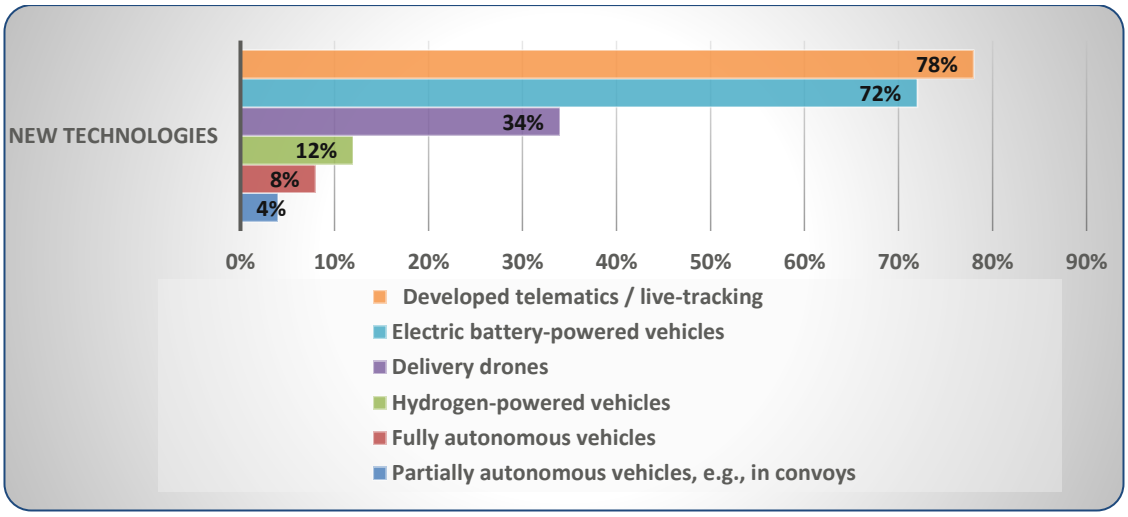


Fig.55 Question no 15, own research

For Polish transport companies, Germany (36%), France(12%) and the Benelux countries (9%) are still the most promising business destinations. Not many Polish companies see their chances in the direction of the Balkan countries (3%) or China (2%). The reason for such results is localization and language issues. The result indicates that Polish companies are more willing to operate in a cultural and linguistic area that is close to them. (see Fig.56.)

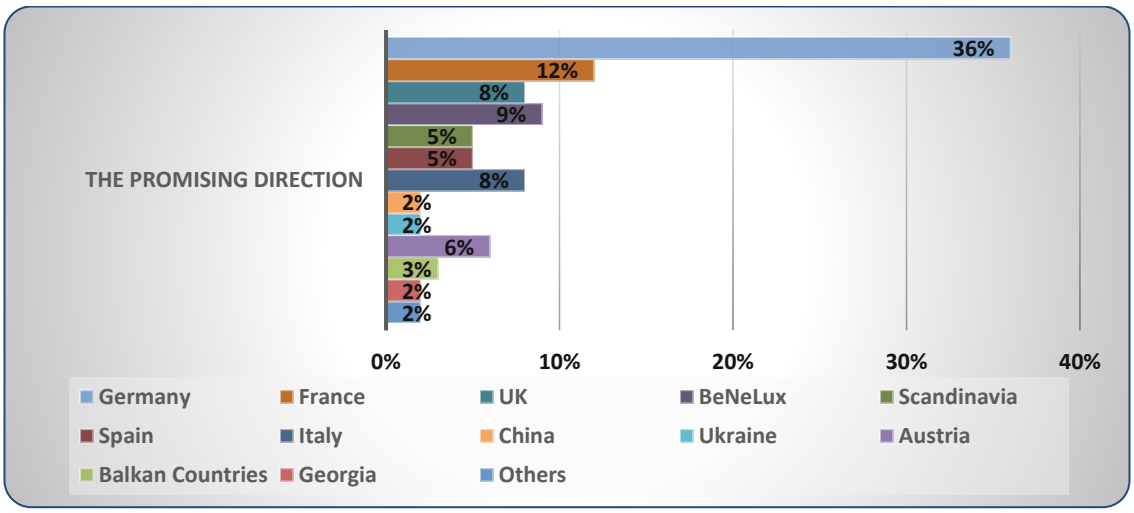


Fig.56 Question no 16, own research

Despite many difficulties and challenges, Polish companies believe that their annual turnover in the next five years will increase from 0 to 5% (24%). Another 14% of respondents believe that their turnover will increase in the range of 6% to 10%. The

respondents, who believe that their turnover will decrease (35%) and 14% of those surveyed are neutral that nothing will change in their turnover. Companies are divided in the sense of increases or decreases in turnover. (see Fig.57.)

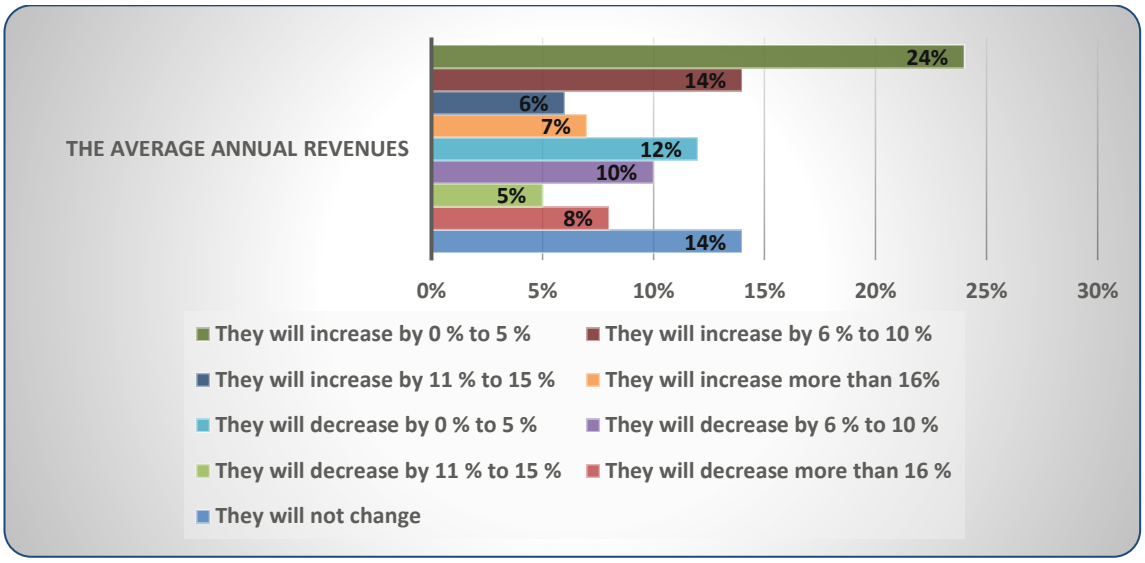


Fig.57 Question no 17, own research

Carriage segments that will develop the fastest in the near future are very diversified. The largest number of companies marked construction materials (21%), then fuels and chemicals (18%), food (17%) and car parts(16%). Due to the investments planned in the future, transport companies expect more transports of construction elements. (see Fig.58.)

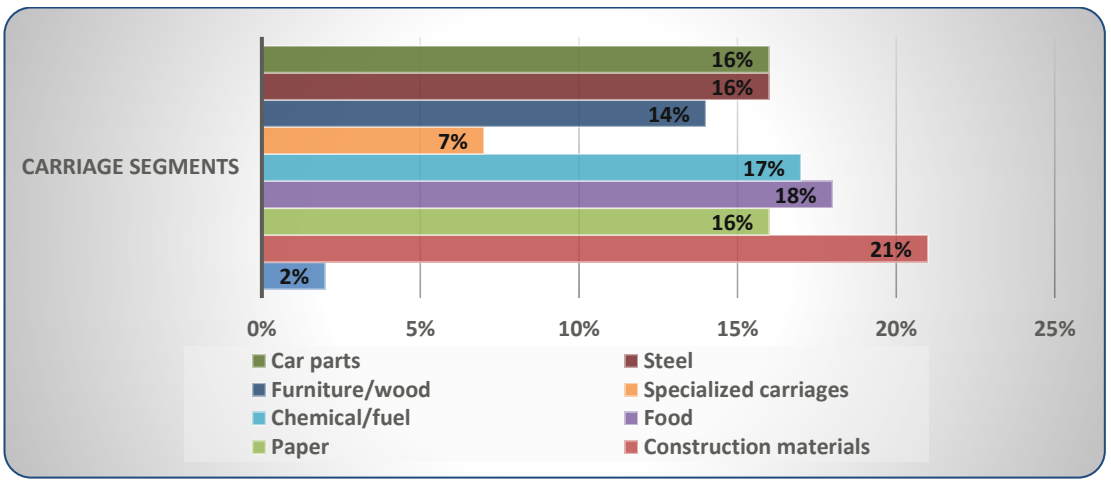


Fig.58 Question no 18, own research

For 72% of companies, the largest group of drivers is Ukrainians. Drivers from Ukraine dominate in Polish companies. It's a natural effect due to geographical location and less language barriers. The next place is taken by Polish drivers and they constitute the largest group in 51% of the surveyed companies. Belarusians (26%) and Kazakh's (20%) are also in Polish transport companies a significant group. The next places are occupied by Russians (10%) and drivers from Uzbekistan (9%) and Georgia (7%). This shows that they come mainly from Eastern Europe and Asia. There are still few drivers from other directions (2%) than those mentioned. There are practically no drivers from other EU countries. (see Fig.59.)

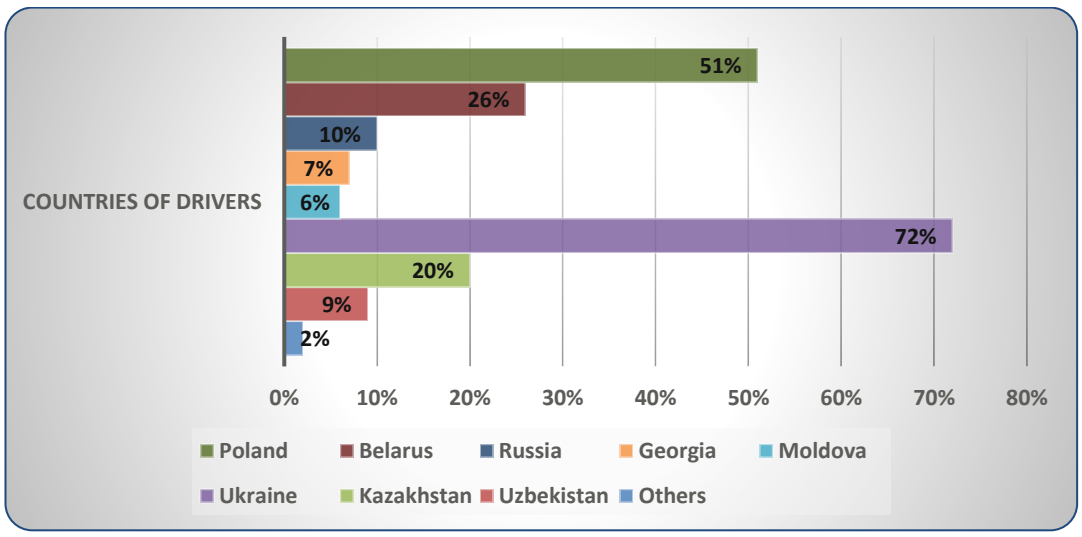


Fig.59 Question no 19, own research

Polish companies in the transport and storage industry currently use telematics (46%) and eco-driving (30%). These are technologies often offered by vehicle suppliers as part of service contracts. 20% of Polish companies use digitalization of supply chain management and 8% use technologies for e-commerce. Big Data technology is known to 5% and AGV to only 3% of companies in Poland. Polish companies use technological support in areas that are more easily accessible and definitely support the transport service itself than storage. This is confirmed by the result of 61% of respondents who believe that their workforce is not sufficiently prepared for new technologies. 8% of companies consider their employees completely unprepared. Companies believe that their employees are sufficiently and very well-prepared in 31% in total. The vast majority believe that their team does not have the appropriate knowledge of new technologies now. (see Fig.60. and Fig.61.)

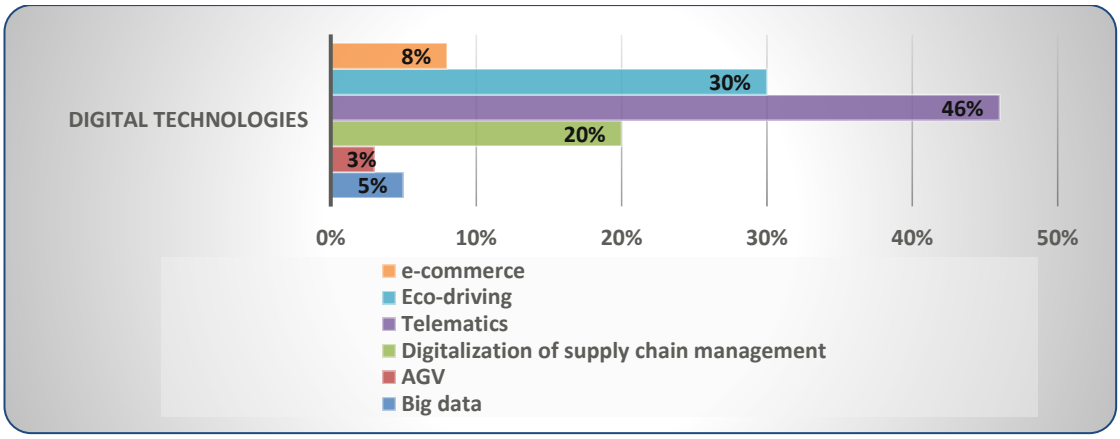


Fig.60 Question no 20, own research

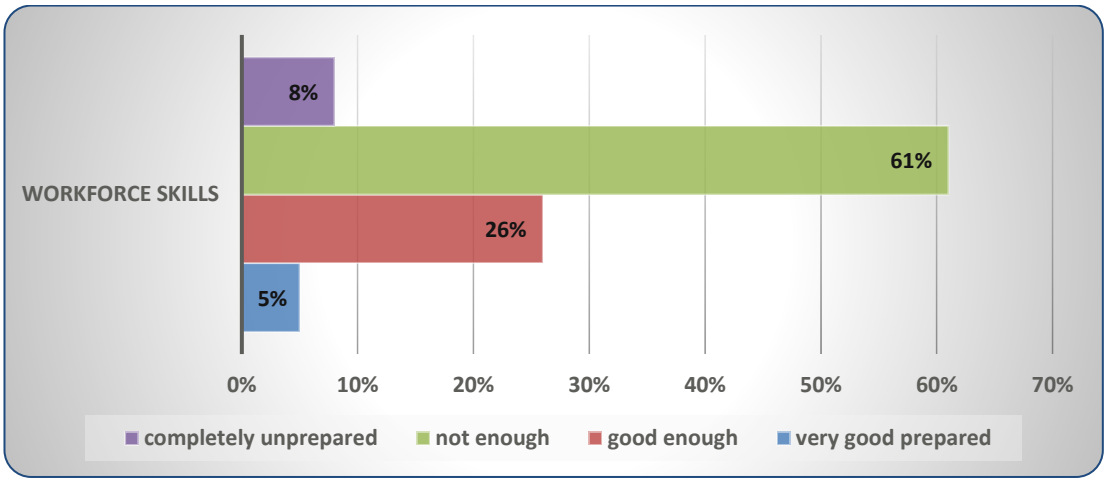


Fig.61 Question no 21, own research

Changing customer behaviour for 40% of respondents will not affect their business in the next 5 years, and for 42% it will be only some difficulties. Serious disturbances are seen by 10% of the respondents and for 8% business will become easier thanks to the changing behaviour of customers. We can see here that half of the companies are afraid of the changing environment to some extent. (see Fig.62.)

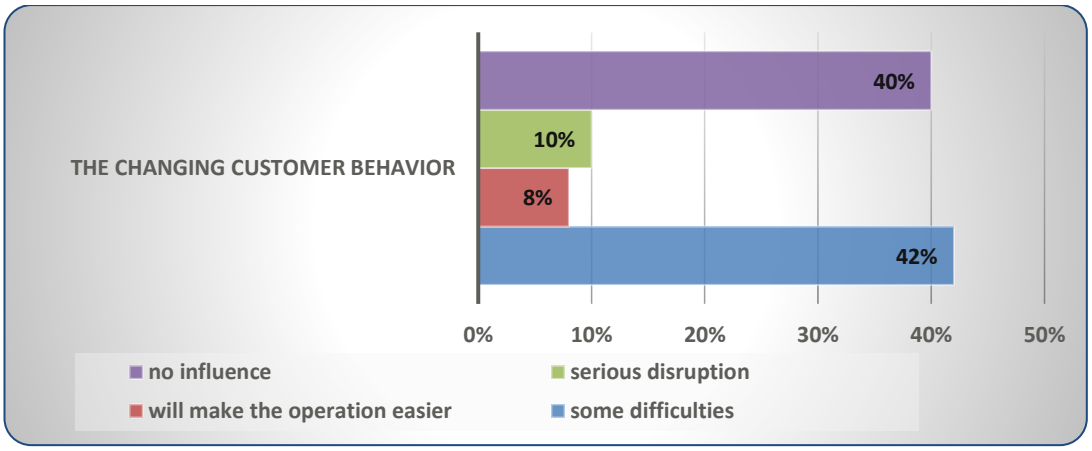


Fig.62 Question no 22, own research

In the area of vehicle financing, the vast majority of Polish companies (81%) use leasing or rental. Only 14% finance their purchases of trucks and trailers from the own funds. This shows how dependent they are on institutions such as banks and leasing. (see Fig.63.)

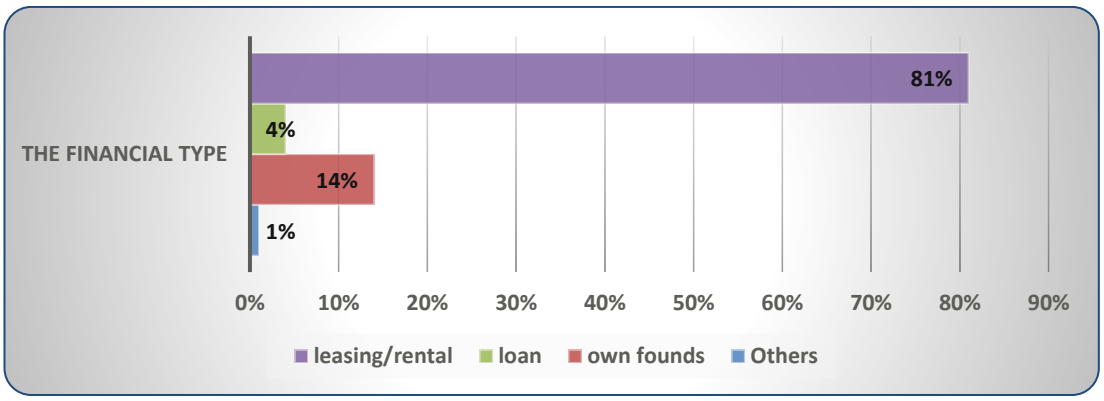


Fig.63 Question no 23, own research

Companies believe that the factors that will help them to keep the position of a driver in the near future include increasing salaries (39%), optimizing routes(19%) and reducing working hours(15%). More paid holiday days (13%) or non-profit benefits (8%) are important to a smaller part of the respondents. Companies believe that typically, financial measures will still help to keep the drivers' workforce (see Fig.64.)

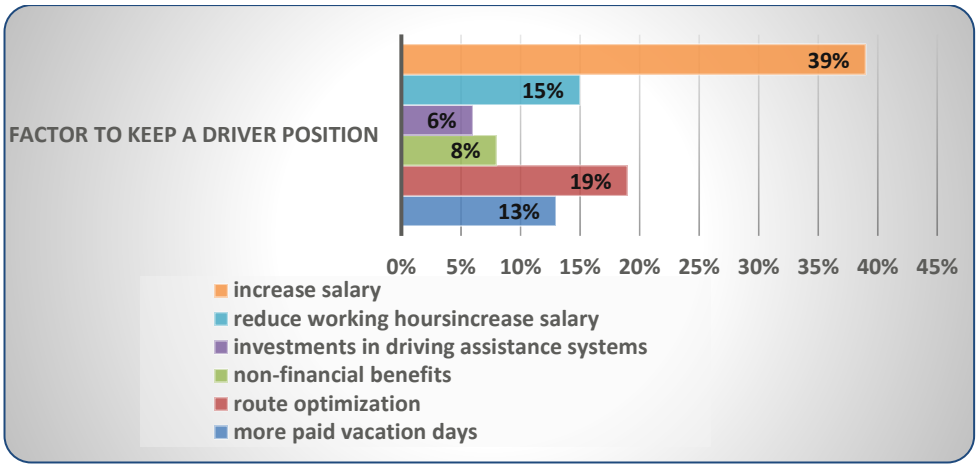


Fig.64 Question no 24, own research

Payment term is an important element in running a business. 83% of transport companies have payment terms from their customers in the range of 31-90 days. Only 12% of respondents should receive their payments in less than 1 month. More than 90 days, which is the longest waiting time for their money, wait 5% of companies in survey. All companies with a payment term of more than 30 days are at risk of NWC issues. (see Fig.65.)

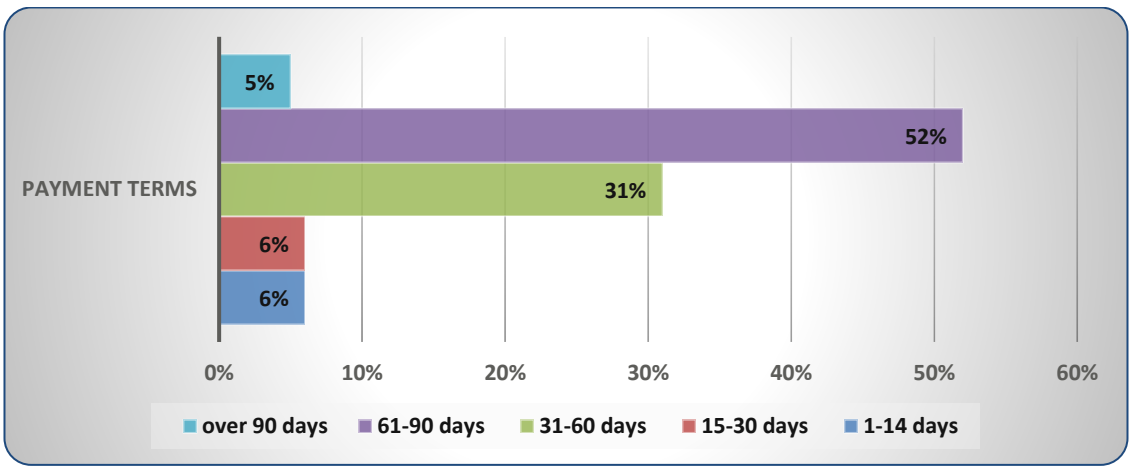


Fig.65 Question no 25, own research

In the area of machine-controlled core, processes can be applied in the next 5 years were electro-mobility (54%) and warehousing robotization (28%). Last mile delivery optimization (16%) and warehousing supported by AR &VR or drones (2%) this is an opportunity for the vast minority of companies. Polish companies are starting to be more friendly with the subject of electromobility and digitization. Vehicle suppliers are also bringing electric technologies closer to end users. (see Fig.66.)

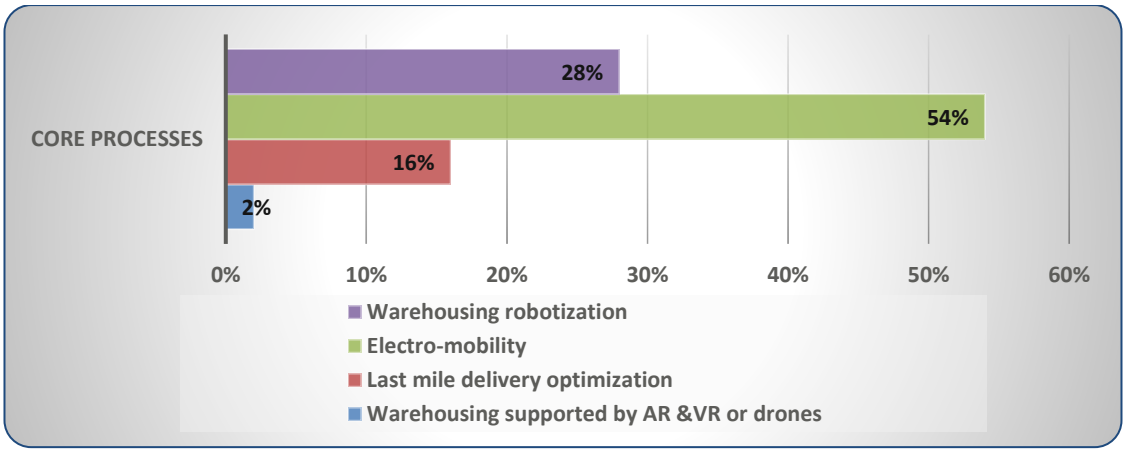


Fig.66 Question no 26, own research

6. Development of the guideline

The results of the survey in the previous chapter allow for the preparation of a guide for decision makers such as owners of transport companies or managers. The transport industry is important in the Polish economy that the guidelines were also addressed to politicians. The guide focuses on several areas such as human resources, new technologies, investments, and finances. Deeper analysis shows areas for improvement in the near future. The guide shows which areas of business activity should be of key importance to decision makers in the transport industry in Poland. Analysing the background and reinforcing it by surveying transport companies gives a solid scientific value.

6.1 Recommendations for improvement with theoretical and practical contribution

Based on the results of the study, areas for improvement were defined, and they concern human resources, new technologies, investing in business and financial issues. Analysing the results of the research, it can be noted that polish transport companies are not sufficiently prepared for the upcoming changes. Their knowledge of new trends is limited and needs to be expanded significantly. Transport companies in Poland have basic knowledge about new technologies, and they do not apply them effectively. They focus on solving daily problems in their business without looking far into the future. Recommendations will indicate the prioritization of activities in order to better prepare the business for the coming future.

6.1.1 Human resources and the working system

The biggest challenges that will be faced by transport companies in the next few years are labor force shortage. The response to insufficient supply of labor force may include supply chain fragmentation, development of intermodal transport. Less young people enter the labor market and their lifestyle is changing. The growing demand for transport industry services and further development mean that the lack of drivers may become a serious problem. The lack of drivers in the transport industry will have an impact on increasing the cost of salaries and then the prices of services. There is too

small investment in human resources, as shown by the study. Companies confirmed that their staff is not prepared for new challenges. The basis of businesses is always people and their skills, therefore, activities in the area of human resources should be prioritized and then expanded to other areas.

Transport companies must prepare for the growth of drivers from different countries outside Europe. The trend of a multicultural environment in Polish companies will strengthen. Salaries in Europe remain attractive. Polish companies are also attractive to drivers from Central Asia, e.g. Kazakhstan, Uzbekistan. If human resources from Eastern Europe will soon be limited, carriers may also consider recruiting employees from other countries, including: Philippines, India. It is interesting that in some countries in Asia there is also a shortage of employees in some sectors, and China is an example.

Polish companies should start cooperation with agencies recruiting drivers in these directions. The adaptation period of such drivers is a complex process. The cultural and mental conditions are completely different in Europe than in Asia. We must not forget about the adaptation of such employees within the company. Here the support of specialists from social areas is needed. The need to open up to new human resource markets for Polish companies is inevitable. Companies that will do it earlier and gain experience will have an advantage over the competition. It will also be important to introduce professional human resources management, especially for drivers with a different culture, coming from Asian countries. Thanks to their international relations, politicians should also take an active part in the search for new employees. State administration should focus its efforts on simplifying the procedures related to employing foreign drivers.

It is also up to local authorities to subsidize training related to the driving profession. Training and the possibility of obtaining a driving licence should be financially easier for those willing. Unfortunately, this is currently a significant barrier for young people. Support from local politicians and co-financing from employment offices and private investors are proposed here. The presence of women is underutilized in this profession. Support programs for women should be created to bring this profession closer. There is a lot of potential in the number of women, and they represent a high quality as drivers. Professions that were marked in the past as typically masculine are currently,

thanks to social programs, brought closer to women who can perform very well in their tasks.

Companies should become more flexible and adapt to the changing expectations of young employees. The proposal here is to change the working hour system.

The expected system is 2 weeks on the road and 2 weeks at home, or 1 week on the road and 1 week at home. The driver's work should become less strenuous. The focus should be on systems supporting loading and unloading. Support in easier and faster cargo securing will also be expected. Companies should start cooperation with professionals who will optimize the time and activities during loading and unloading.

The surveyed companies are aware that they have to look for new employees and invest in their skills, but they do not establish cooperation with professionals in the field of science. This should change in the future because university knowledge will be crucial to entering a higher level in such a rapidly changing environment. This applies to the managerial staff responsible for the introduction of strategic changes.

6.1.2 Recommendations with new technologies

The low level of digitization of Polish transport companies forces many changes and investments in the near future. Unfortunately, development is needed in this area. Polish road transport companies should urgently carry out basic digitalization of internal processes TMS or administrative and external ones e.g. platformization of service. Systems based on advanced telematics will be the future of the transport industry. Transport companies should actively introduce live-tracking of their services. Customers expect from transport companies to make it possible to check the load location and delivery time in real time. Monitoring will make customer service more attractive and improve the quality. Customers expect IT solutions from truck and trailer suppliers. This offer will certainly be developed and digitization of services will be widespread. Making modern technologies popular on a large scale in the near future, including blockchain or electronic waybills, will be an opportunity to build an advantage. Switching to electronic document flow may contribute significantly to accelerate settlement of liabilities on time and reducing overdue payments.

Dynamics of change affecting the industry transport, in addition to the use of expert knowledge, requires even faster implementation of new IT solutions that allow for effective cost control. In the last 20 years, carriers did not need advanced technologies supporting transport to develop, which is why the level of digitization in Poland is currently low. Companies increased their revenues without the support of technology, forgetting a little about it. The international carriers are interested in digitalization and see an opportunity for a new source of revenue. For domestic companies it will be a source of improved efficiency and quality. Transport companies see an area for improvement for electromobility, but it is still limited to the vehicle itself. New technologies need investment and more financial resources. This could result in more concentration of companies in the industry. Two technological trends will drive the transport industry: alternative drives such as electric vehicles, CNG vehicles, LNG vehicles and autonomous vehicles, but that's in the far future, and it won't happen in the next 5 years.

Polish companies do not look forward to such high-tec technologies as drones or autonomous vehicles. Many companies do not look so far into the future and focus on the current situation. The perspectives are very limited and narrow.

In the area of new technologies, Polish transport companies should be more open to telematics and eco-driving technologies in the first place, and then to electric vehicles and warehouse automation. This will strengthen their position compared to other companies from outside the EU.

6.1.3 Investments in new strategies and openness to change

New technologies and changes are always related to investing and taking some risk in business. However, it can give an advantage over competitions in the short and long term.

Fragmentation of the supply chain and the development of intermodal transport is one of the options to solve the problem of labor shortage. Drivers will be able to work on shorter routes and be at home more often. The transport of goods is carried out using containers or a swap of bodies. Intermodal transport is included in the policy of reducing CO2 emissions in the EU. The proposal here is to diversify the type of

transport and invest in intermodal transport. It is a solution for the environment and staff shortages. For these reasons, the importance of intermodal transport will grow in the near future. In order to develop intermodal transport, substantial investments in construction of railway network and reloading hubs are necessary. Such investments take many years and are feasible only with support of central and local authorities.

Due to staffing issues, a general admission of longer vehicles should be considered. Approval of 25-meter-long vehicle units would allow for transport of 20 to 30 percent more commodities. As a result, transport of the same volume of goods would require fewer employees. Such vehicles are already approved in Scandinavian countries. Due to the optimization of transported loads, we can achieve savings that are so relevant for small and medium-sized transport companies where there is no force to scale. Unfortunately, but here too, support from politicians is needed to change the regulations.

Polish transport companies have been active on the same markets for many years. The direction to Germany, France and Great Britain is still perceived as future-oriented and the most promising. Polish companies must be open to business cooperation on new markets. Fleets should use their experience and quality to expand their services to new destinations. The road transport market also needs companies specialized in domestic transport with high quality services. Polish transport companies are too much dependent on international transport. This is associated with high risks due to changes in laws and regulations. They do not pay enough attention to domestic transport and do not diversify their services. As the results of the research showed, the mobility package and increasing environmental requirements will hinder business, and this is an area of high risk for Polish companies. In this case, transport companies in Poland do not have an appropriate business risk assessment. Increased costs and low margins in the transport industry may lead to the bankruptcy of the weakest units. Due to the expected changes, large scale companies are likely to perform better. Meeting the expectations of big corporations and legal requirements from the European Union will increase investments and costs in companies.

Transport companies should not only focus on the purchase of new trucks and trailers, but also invest in the digitization of processes and improving the competences of employees. This is relevant in the perspective of a lack of human resources in the near future. Improving processes with less human effort will be a key task for companies.

CO2 emission standards will force companies to invest in new trucks anyway. This is a natural process, but companies perception of the future must be broader and not only limited to new vehicles. Many companies already have too high a percentage of vehicles parked in the car park. The reason is the lack of drivers and high operating costs. The solution will be to open up to new markets and a new business model.

6.1.4 The financial condition of transport companies

Financial issues are a particularly important area for improvement. Low profit and long payment terms will not adequately secure transport companies for a possibly difficult future. The risk of bankruptcy in such a case is high. Long payment terms disrupt cash flow. The equipment is mainly financed by leasing and interest rates are currently high. Many customers still do not accept electronic document flow. They require a paper document to pay for services. The Polish transport industry, despite its importance for the Polish economy, is not supported by the government. Due to its key position, it should be covered by a special support program for development. The government should support the development of new technologies, investments related to CO2 reduction and new jobs in the transport industry. Subsidies should cover, for example, the purchase of longer vehicles or technologies supporting the driver's driving. The importance of the transport industry should be shown more to politicians. The described financial buffer created by companies could carry out investments and improve cash flow. It is necessary to create a special budget to support small and medium-sized transport companies that want to develop. Small companies are exploited by their customers and receive very long payment terms. They do not have negotiating power and 90-days payment terms is very dangerous for them. Their cash flow is very weak. The recommendation here is to shorten payment terms. Shortening payment terms by 30 days would definitely improve the financial condition of companies.

Consolidation in the road transport industry is progressing. Big companies will become stronger and will take over smaller and less financially stable units. They have a scale effect that helps operate in a low margin industry.

7. Conclusion and Outlook

Coming back to the main research question: *„How can road transport companies in Poland prepare to the upcoming challenges?“,* it should be noted how broad the scope of the analysis is and how many areas of this industry this work touches. Operating in the transport industry requires appropriate preparation but also a professional action plan. The points analyzed in this paper allow to answer the question whether and how Polish transport companies are prepared for the upcoming changes. Polish fleets have a solid base of preparation for the upcoming challenges in the near future. The questionnaire conducted among professionals and practitioners from the industry, and indicate one thing : „*What is the knowledge of road transport companies concerning key trends in the road transport industry?“.* The analyzed research material shows exactly the level of this knowledge and areas for improvement. Following the key trends in the economy are important to achieve success or simply survive in the industry. Learning about technological mega trends and following them help in business development, creating an advantage over the competition. Polish companies are already partially implementing tasks related to meeting the challenges that await them in the near future. This work successfully answers the question posed previously, i.e „*What is the degree of action coping with these challenges?“*

The all research questions posed in this work were answered and it helped to create an appropriate guide for the transport industry in Poland. Answering the research questions in this paper, one conclusion comes to mind. Polish transport companies need stability, openness to new technologies and flexibility in operation.

Over the last three decades of consistent and hard work, the Polish transport industry has achieved a leading position in Europe. It should be noted that without significant participation of the Polish government. Of course, the EU structures to which we have belonged since 2004 and the open market helped the Polish economy to develop very strongly. The transport industry will be a key importance to the Polish economy for a long time and should be supported. The Polish transport industry is a source of state budget revenues, but also for key Polish and European branches of economy. The conditions in which the transport business works is very sensitive to changes.

Polish transport companies have made a huge evolution and development. All their strengths have been significant in the last 5-10 years. Polish transport companies have

built their strong position in Europe thanks to professionalism, quality of services and lower costs. Polish companies face a huge challenge for which they are not sufficiently prepared at the moment. Most companies do not see the threats, challenges and opportunities. The majority of road transport companies in Poland do not have a clear development strategy for the near future. In their operational activities, they are not focused on introducing new technologies that will build their competitive advantage and improve efficiency. Polish companies are in the initial phase of introducing solutions that will support their daily business. People working in this business are aware of today's solutions, but they do not have a precise plan for their implementation in their companies. This is the last moment to plan the specific stages of changes that Polish transport companies will face in the next 5 years. The key is to make the right decisions. Companies that do not take appropriate action and risk will have many difficulties with their business. In the coming years, we will for sure face major changes in the market. The position of Polish companies today is very good, but without appropriate actions this can change quickly. Polish transport companies must be prepared for new challenges. Not only legal but also technological challenges.

Support from government authorities will be necessary to maintain the current position of the transport industry in Europe. All activities should focus on supporting further development, improving the social conditions of employees and protecting the environment. The process that awaits Polish transport companies in the next 5 years may be their biggest challenge in history. Thanks to its flexibility and ability to adapt to new geopolitical and market conditions, Polish transport is still in good condition, although the negative impact of supply chain disruptions and the increase in energy and raw material prices. The next five years will be important in terms of process reorganization, optimization and innovation. Polish transport companies must become open and flexible to changes. Despite some delay in the implementation of innovations, Polish entrepreneurs are creative and strongly involved in their businesses. Our companies must find a way to adapt to the new reality. Speaking of Poland as the *"logistic hub of Europe",* we see that domestic transport will be the basis of logistics and an essential element of operation. Today, the mood is not positive and in the next 2-3 years, Polish transport companies must take into account lower profitability. Later, however, the position of this sector will be strongly restored.

Transport companies will face changes and challenges, but those companies that carry them out efficiently will achieve a competitive advantage. Thanks to its good location, Poland will be an important element of the entire mechanism of European road transport. The general forecasts for the industry, despite many problems, are positive. Polish transport industry, despite many changes, is doing great thanks to the ability to quickly adapt to changes in operating conditions.

In the context of many changes in the industry, it will be more important to build relationships with reliable suppliers and customers. Polish companies have already shown in the last years that they can do it. There are a lot of opportunities for Polish transport companies that can be exploited with the skilful use of their advantage. It is always more difficult for leaders run away from aspiring players, but the starting point and current position for Polish entrepreneurs is solid.

8. Bibliography

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9. Appendix 1

Thank you for taking the time to fill in this questionnaire; it should only take 25 minutes. Please return your completed questionnaire to Piotr Bogdanski p.bogdanski@yahoo.com

*Your answers will be treated with complete confidentiality, and unless you choose to provide an e-mail address, will be entirely anonymous. Please do not write any identifying marks on this questionnaire as participants are meant to be anonymous If you have any questions about this questionnaire, please contact Piotr Bogdanski telephone number: +48 6** ** ** *5 or e-mail p.bogdanski@yahoo.com*

Please click here to indicate your informed consent to participate in this study ☐

Part A.

Question 1

Are you:

☐ Male

☐ Female

Question 2

In what age group are you?

☐ 19 and under

☐ 20 – 29

☐ 30 – 39

☐ 40 – 49

☐ 50 – 59

☐ 60 +

Question 3

What is your position?

☐ The President

☐ Member of the Management Board

☐ Owner

☐ Manager

☐ Other

Question 4

What is the fleet size at the disposal of your company? (please tick one)

☐ up to 10 vehicles

☐ 11-50 vehicles

☐ 51-100 vehicles

☐ 101-200 vehicles

☐ more than 200 vehicles

☐ no fleet

Part B.

Question 5

What kind of transport does your company specialize in? (please tick one)

☐ Full Truck Load (FTL)

☐ Less than Truck Load (LTL)

☐ specialized carriages- Courier, Express and Parcel (CEP)

Question 6

What kind of services does your company specialize in? (please tick one)

☐ services for final customer

☐ the company performs services for end customers and as a subcontractor for other companies in approximately equal proporitons

☐ subcontractor for other forwarding or transport companies

Question 7

What kind of transport does your company specialize in? (please tick one)

☐ mainly domestic carriages

☐ mainly international carriages

☐ the company perform domesticc and international carriages in approximately equal proportions

Question 8

Would you decide to open a transport company in the current business and economic environment? (please tick one)

- ☐ yes, definitely
- ☐ rather yes
- ☐ probably not
- ☐ definitely not

Question 9

Is the company you work for, taking actions to raise the quality of the future staff? (please tick one)

- ☐ Yes, by a well-developed internal training system
- ☐ Yes, by coopertion with universities
- ☐ Yes, by cooperation with vocational schools
- ☐ No

Question 10

Whether in the last 6 months there was an open recruitment at your company?

- ☐ Yes
- ☐ No

Part C

Question 11

Average assessment, on a scale from 1 to 10, the importance of events your company will face in the next 5 years? (1 means a very small problem, and 10 - a very big problem)

Lack of drivers

Mobility Package

EU regulations on emission

War in the areas of company activity

Companies from the East/Asia

Question 12

What kind of investments does the company plan in the next 5 years?(It is possible to mark all investments planned)

- ☐ Purchase of new vehicles/ semi-trailers
- ☐ Investment in digitalization of processes
- ☐ Construction of a logistic warehouse
- ☐ Improving of employee competences
- ☐ Development of transport-related services
- ☐ Other

Question 13

What possible impact the Mobility Package will have on the company you work for?(please tick one)

- ☐ The company will register activity outside Poland
- ☐ The company will continue to operate in the same way, but at higher costs
- ☐ The company will focus mainly on domestic transport
- ☐ The company will start to develop in other directions outside the EU
- ☐ There will be no significant impact on the company
- ☐ The company will be acquired by another

Question 14

What percentage of trucks in your company are currently parked due to lack of orders? (please tick one)

- ☐ 0% - 5 %
- ☐ 6% - 20 %
- ☐ 21% - 40%
- ☐ 41% - 60%
- ☐ 61% - 80%
- ☐ 81% - 100%

Question 15

What new technologies will be used in the transport industry in the next 5 years? (It was possible to mark more than one answer)

- ☐ Fully autonomous vehicles
- ☐ Electric battery-powered vehicles
- ☐ Developed telematics / live-tracking
- ☐ Delivery drones
- ☐ Partially autonomous vehicles, e.g., in convoys
- ☐ Hydrogen-powered vehicles

Question 16

Which direction do you believe to be most promising for the company in the next five years? (please tick one)

- ☐ Germany
- ☐ France
- ☐ Great Britain
- ☐ BeNeLux
- ☐ Scandinavia
- ☐ Italy
- ☐ Spain
- ☐ China
- ☐ Ukraine
- ☐ Austria
- ☐ Balkan Countries
- ☐ Georgia ☐ Others

Questions 17

In what way, in your opinion, will the average annual revenues of your company change in the next 5 years?

- ☐ They will increase by 0 % to 5 %
- ☐ They will increase by 6 % to 10 %
- ☐ They will increase by 11 % to 15 %
- ☐ They will increase more than 16%
- ☐ They will not change
- ☐ They will decrease by 0 % to 5 %
- ☐ They will decrease by 6 % to 10 %
- ☐ They will decrease by 11 % to 15 %
- ☐ They will decrease more than 16 %

Question 18

Which carriage segments provided by your company will be grow up most dynamically in the next 5 years? (It is possible to mark no more than three answers)

- ☐ Car parts (automotive)
- ☐ Food
- ☐ Paper
- ☐ Construction materials
- ☐ Steel and steel products
- ☐ Furniture / wood
- ☐ Specialized carriages
- ☐ Chemical/fuel products
- ☐ Others

Question 19

Which countries do drivers in your company mostly come from? (It is possible to mark no more than three answers)

- ☐ Poland
- ☐ Belarus
- ☐ Russia
- ☐ Georgia
- ☐ Moldova
- ☐ Ukraine
- ☐ Kazakhstan
- ☐ Uzbekistan
- ☐ Others

Question 20

Which digital technologies from the transport and storage sector is currently using by your company? (It is possible to mark no more than two answers)

- ☐ Big data
- ☐ e-commerce
- ☐ Digitalization of supply chain management
- ☐ Telematics
- ☐ Eco-driving
- ☐ Automated Guided Vehicle

Question 21

How is your workforce prepared (skills) for new digital technologies? (please tick one)

- ☐ very good prepared
- ☐ good enough
- ☐ not enough
- ☐ completely unprepared

Question 22

how the changing customer behavior affect the transport business in the next 5 years? (please tick one)

- ☐ no influence
- ☐ serious disruption
- ☐ will make the operation easier
- ☐ some difficulties

Question 23

How are trucks most often financed in your company?(please tick one)

- ☐ leasing/rental
- ☐ loan
- ☐ own funds
- ☐ others

Question 24

What factor will be the most important in your company to attract or keep a driver position?(It is possible to mark no more than two answers)

- ☐ increase salary
- ☐ reduce working hours
- ☐ investments in driving assistance systems
- ☐ non-financial benefits
- ☐ route optimization
- ☐ more paid vacation days

Question 25

What is the average payment term your company has from its customers?

- ☐ 1-14 days
- ☐ 15-30 days
- ☐ 31-60 days
- ☐ 61-90 days
- ☐ over 90 days

Question 26

What solutions in the area of machine-controlled core processes can be applied to your company in the next 5 years?(please tick one)

- ☐ Warehousing robotization
- ☐ Electro-mobility
- ☐ Last mile delivery optimization
- ☐ Warehousing supported by AR &VR or drones