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SUMMARY

Three objectives and three research hypotheses were defined in this doctoral thesis. The following research methods were used to achieve the objectives and verify the research hypotheses: literaturę analysis, unstructured interviews, indicator analysis, environmental risk analysis, and SWOT/TOWS strategie analysis.

The first objective was to identify measures of efficiency and environmental sustainability in the transport company. Economic efficiency indicators are described in section 3.2. Transport efficiency indicators for the analyzed company are estimated in section 4.3. Environmental sustainability indicators are characterized in section 3.1 and determined based on data from the analyzed transport company in section 5.2. The first research hypothesis was formulated based on the defined objective. This hypothesis assumes that maintaining environmental sustainability by the transport company contributes to an inerease in its economic value. This hypothesis has been positively verified.

Based on the literaturę analysis and data collected during the unstructured interviews, it has been concluded that:

» The studied enterprise uses modem vehicles for a period not exceeding 5 years. As a result, all means of transport available in the company meet one of the most rigorous fuel consumption standards, which directly translates into maintaining environmental sustainability. At the same time, it should be emphasized that modem trucks are characterized by reduced malfunction rates and lower fuel consumption, which inereases the economic efficiency of the studied company.

- The studied company uses information Systems that allow for the optimization of routes and schedules (LockTracker), and those that allow for a reduction in fuel costs, an improvement in fleet efficiency, and a reduction in harmful emissions into the atmosphere (Eco-driving). The implementation of the above-mentioned information systems undoubtedly contributes to both inereasing the efficiency of transport processes and maintaining environmental sustainability.
- It is still reasonable to use information systems in the analyzed company that help reduce empty mileage. In 2022, the ratę of transport vehicle utilization was 80.97%. By further inereasing this indicator, the studied company will achieve both economic and environmental benefits.

An important aspect of the company's activity is training its drivers. During the training, the drivers learn about fuel-efficient and ecological driving, emission reduction, and other enviroranental protection-related issues. Acąuiring that kind of knowledge indirectly translates into increasing the company's economic efficiency by lowering the costs of its economic activities.

The economic efficiency of transport processes in the studied company is high. The reliability and delivery readiness indicator for the analyzed period from 2017 to 2022 was 100% for most years. The exception was 2018, when the transport reliability indicator was 76% and the delivery readiness indicator was 90%. This was due to the increased malfunction ratę of fixed assets and a greater number of damages that occurred during transport that year.

In order to reduce cargo damages during transport and limit the malfunction ratę, the analyzed company's drivers should be trained in safe driving and proper handling techniąues. This will contribute to increasing the company's efficiency through improving the effectiveness of transport process indicators, and to maintaining environmental sustainability through reducing the number of situations in which unwanted substances (such as fuel, coolant, brake fluid, and especially dangerous goods) could get into the environment, causing soil and water contamination.

The efficiency of transport processes in the studied company directly affects its economic efficiency and indirectly affects the preservation of environmental sustainability. The company undertakes actions aimed at reducing the impact of road transport on the natural environment. However, the company's priority is to maintain high economic efficiency. The implementation of environmental protection measures, such as using the LockTracker Computer system, driver training in ecodriving, and utilizing vehicles with the lowest emissions, primarily aims to reduce the costs of the company's economic activities. Therefore, environmental protection is a secondary result of the actions taken.

Reducing the malfunction ratę of transport vehicles and increasing their utilization ratę have a positive impact on the company's economic efficiency. The former leads to a decrease in vehicle repair costs and better utilization of driver and vehicle working time. At the same time, the latter results in even better resource allocation in the analyzed enterprise.

Maintaining transport reliability and readiness indicators at 100% may negatively affect the economic efficiency of the studied enterprise. In some situations, striving to maintain transport reliability and readiness at the highest level reąuires providing transportation

services within a specified deadline, regardless of costs. This approach reduces the economic

efficiency of the studied enterprise.

- Increasing the utilization ratę of transport vehicles in the examined enterprise has been observed to have both positive and negative effects on the natural environment. The positive effects result ffom reducing the number of trips, which leads to a decrease in the consumption of operating materials and a reduction in the emission of harmful substances into the environment. At the same time, greater use of the cargo space may contribute to increased wear and tear on vehicle operating materials, such as tires, brake linings, or oils, which results in morę fluids and dust being released into the environment, leading to environmental pollution.
- The fuel consumption ratę per vehicle in the researched company decreased between 2017 and 2022. This means that the actions undertaken by the company to encourage economic and ecological driving had the desired efifect. An exception to this trend was only 2020, when the COVID-19 epidemie State was introduced, causing drivers to pay less attention to eco-driving principles and focus morę on ensuring the efficiency of transport processes.
- The emission of pollutants into the atmosphere by vehicles carrying out transport in the examined enterprise has been increasing year by year. The dynamics index determined for the years 2018-2022 in relation to the previous year was respectively: 132%, 121%, 129%, 106%, and 128%.
- The emission of carbon dioxide into the atmosphere by vehicles used for carrying out transportation services in the examined company is the highest compared to other substances released into the atmosphere with exhaust fumes. Therefore, the company must focus on reducing C02 emissions into the atmosphere in the coming years;
- In the years 2017-2022, the company saw a gradual increase in the environmental fee, which was due to higher fuel consumption in individual years and an increase in the unit ratę of the environmental fee.
- The costs stemming ffom the use of spare parts and vehicle servicing in the examined enterprise increase every year. On the one hand, this has a negative impact on ensuring economic efficiency. On the other hand, it has a positive impact on ensuring environmental sustainability.

The second objective of the dissertation was to determine the relationships between the conseąuences and the likelihood of environmental risk occurrence in the examined transport company. Issues related to environmental risk management as a tool for achieving environmental objectives are described in section 3.3 of the dissertation. Section 5.1 presents the

environmental risk diagnosis prepared in the researched company and the proposed directions of changes in this area. Based on the second goal, the second research hypothesis was defined as follows: environmental risk management supports the achievement of environmental objectives in the transport company. The second hypothesis has also been positively verified, as it has been established that:

- An environmental risk diagnosis was conducted in the examined company;
- Risk management in the examined company involves a planned and deliberate analysis and control of risks, the result of which is the minimization of the negative effects of road transport on the natural environment;
- Environmental risk management in the examined company is based on a number of factors such as: factors related to company management, organizational factors related to transportation, factors related to transport implementation, human factors, technical factors, and random factors;
- It is advisable to refine the previous environmental risk diagnosis in the examined company. Recommendations in this area have been proposed. These recommendations may contribute to the continuous improvement of the examined transport company.

The first proposed change was to modify the risk previously identified as ZP1, called "lack of knowledge or non-compliance with environmental law regulations". In this case, it was reasonable to divide this risk into two separate ones, as it had been established that the lack of knowledge about environmental regulations and non-compliance with these regulations are two distinct issues with significantly different causes. The second proposed change concems the risk identified as CT1, "poor vehicle condition". In this case, different types of vehicle failures affect the natural environment in different ways. For example, increased emissions can result from a faulty fuel supply system, while an increase in suspended particles can be caused by excessively wom brake pads or tires. Similarly, excessive noise emissions are caused by a poor condition of the gearbox. Therefore, it is reasonable to specify this risk, for example, to better understand the problem of environmental pollution caused by means of transport, that is, to understand the causes and effects of its occurrence.

The third objective of the doctoral thesis was to identify an efifective strategie tool for determining the directions of development of the transport company in the area of environmental sustainability. Strategie management issues in the context of using one of the methods of strategie analysis are described in section 3.2 of the thesis and applied in section 5.3. Identification of the objective allowed for formulating the third research hypothesis: strategie

analysis tools contribute to the development of the transport company in the area of environmental sustainability. The hypothesis has been verified positively based on the research conducted using the SWOT/TOWS method, as it has been concluded that:

- The analyzed company's development directions can be determined by means of developing a strategy;
- The strategy may relate to the entire analyzed company or only its fimctional areas, such as environmental protection;
- The development of a strategy for the examined company in the area of environmental sustainability was possible thanks to the strategie analysis conducted using the SWOT/TOWS method;
- The most significant strength of the researched company in terms of ensuring environmental sustainability is the use of vehicles compliant with the EURO 6 and EURO 6d standards for transport services, while its most significant weakness is the use of diesel- powered vehicles for business activities;
- The greatest opportunity for the development of the researched company in terms of ensuring environmental sustainability is the production of ecological heavy-duty vehicles (e.g., with Bio-LNG and Bio-CNG drive), while the most significant threat is the introduction of new legał regulations in the field of sustainable transport development, to which one must continuously adapt;
- In the analyzed company, in order to ensure development in the area of environmental sustainability, an aggressive development strategy, the so-called maxi-maxi strategy, should be pursued;
- One of the planned directions for futurę actions is to ensure that the analyzed company's strengths are utilized, so that it can take advantage of emerging opportunities for its development in the context of enyironmental sustainability. In this case, the first of the analyzed company's strengths should be used, which is the possession of transport means compliant with EURO 6 and EURO 6d standards, to implement further innovative technologies that are being introduced in the logistics sector.
- The second of the planned directions for strategie futurę actions should be aimed at creating a situation in which the opportunities arising in the environment can reinforce the strengths of the analyzed company. In this case, the company should consider introducing new types of services, such as multimodal and/or intermodal transport. This will contribute to enhancing its strengths such as its image of an enterprise continuously striying for development while

respecting the natural environment, and also allow for even better utilization of modem information Systems for transport management.

In conclusion, it has been found that the management of the analyzed transport company is focused on ensuring high economic efficiency of activity while ensuring environmental sustainability. At the same time, it has been inferred that this relationship is two-way, as ensuring environmental sustainability indirectly affects the company's economic efficiency. Long-term development plans for the analyzed transport company in the area of environmental sustainability should be oriented in such a way so as to utilize its strengths to the fullest extent possible while taking advantage of emerging opportunities.