

SUSTAINABLE DEVELOPEMENT IN LOGISTIC – A STRATEGY FOR MANAGEMENT IN TERMS OF GREEN TRANSPORT

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Abstract:

Supply chain management is one of the most important elements of sustainable development. And due to the fact that the world market is driven by supply and demand, and the determinant of access to products is regional and international logistics, this paper focuses on the possibilities of implementing a green transport strategy in the context of sustainable development in logistic enterprises. This paper presents the results of the SWOT analysis pointing out the strengths, weaknesses, opportunities, threats of green vehicles market for the transport enterprises. It was noticed that the situation on the green vehicles market for the transport enterprises is characterized by the advantage of strengths and these strengths should be used to maximize the use of green vehicles. It emphasized that subsidies for green vehicles would allow to invest in a modern fleet, new solutions (e.g. own charging stations) can have an impact on the greater energy efficiency (self-sufficiency), increase of social awareness would force enterprises to take appropriate actions in the field of environmental protection and development of public transport based on green vehicles.

Key words: *SWOT analysis, sustainable development, green transport, green logistics, sustainability*

INTRODUCTION

The logistics (as a significant element in supply chain management) is one of the industry branch that have a significant impact on the increased production of carbon dioxide, and thus on air pollution. For several decades, research, strategic, social and structural activities have been carried out, the main purpose of which is to answer the bothering question – how, in a strongly developing economy and industry, to minimize the negative impact of humans on the environment (especially when this development is based on energy supplies).

One of the methods of caring for the environment are the constantly growing requirements in the field of environmental policy in Europe and in the world, which results in the multiplication of new technologies and possibilities (innovations) in the field of regional and international transport. Minimizing environmental pollution is a priority of the environmental policy that applies until 2050 [1, 2]. Such activities within the law and policy, as early as at the end of the 20th century, but especially in the second decade of the 21st century, resulted in a dynamic development in the field of „green” fuels in road, rail and sea transport [3]. As shown by numerous very interesting studies, it is very

difficult to change the attitude of citizens to new, often unknown fuel technologies. Therefore, it is suggested to start changes by changing the attitude of entrepreneurs to technologies favoring environmental protection.

LITERATURE REVIEW

Supply chain management is one of the most important elements of sustainable development. This is due to the fact that both the logistics itself and the supply chain, in order to adapt and mitigate business logistics, should be oriented towards the protection of resources and care for the environment – towards the green transport [4, 5, 6, 7, 8]. Green transport is an element of green logistics and is defined as the management of supplies (materials and products) that reduces the environmental and energy footprint of the distributed goods. Green Transport involves an organization's activities that take environmental considerations into account and integrate it into supply chain management to change the environmental performance of suppliers and customers [9].

To address the significant contribution of transport (professional transport) to greenhouse gas emissions, the government continues to develop a green transport strategy

(GTS). The main goal of green transport is to minimize the negative impact of transport on the environment, while taking into account current and future transport needs. One of the tools of the green transport strategy is also encouraging the implementation of modern technologies. Activities related to ecological transport also include monitoring the involvement of entrepreneurs in the development of green technologies [2].

Because the implementation of the concept of sustainable development remains the greatest challenge in the world, it is even more important to understand what elements should be given special attention [10, 11]. All kinds of changes are particularly difficult to introduce in small and medium-sized enterprises, where global management trends are often ignored. There are many problems when implementing new technologies and concepts in sustainable enterprise management (and not only logistics), ranging from organizational (management) barriers, through the enterprise culture and social attitude to the upcoming changes [12, 13, 14].

As the Klimecka-Tatar and Ingaldi (2020) point out, there are many barriers that cause a negative attitude to changes in habits with regard to the use of energy sources [15, 16]. Such barriers are visible in almost all technological changes – not only in the concepts of technological development, but also in the concept of the Industry 4.0 strategy or the Lean concept [17, 18, 19, 20, 21].

The social barrier seems to be the most difficult to break. Social resistance, which may result in the lack of acceptance of the introduced changes, is the most frequent cause of delay in investments and industrial innovations. The mental barrier is also closely related to the previous one. The source of the mental barrier can be found in the lack of knowledge (or insufficient knowledge) in a given topic. Obviously, various types of social campaigns seem to be helpful in this respect, and they should be supported by earlier research identifying the causes of social resistance. In order to increase the awareness of the society (including the entrepreneurs themselves), it is necessary to introduce a knowledge management strategy from a global perspective – with the delineation of areas for improvement [22, 23, 24, 25, 26].

The third but key barrier is the economic barrier. The economic barrier itself is a very big problem in the concept of sustainable development in supply chain management. This barrier may, by its strength, hinder development in many areas. What is more, it can often become a support for building social and mental resistance. The lack of financial resources is a very big problem in the implementation of innovations and modern technologies. In this regard, social programs/projects (previously discussed) financed from national or international funds (often supported by the European Union) are helpful [2, 27].

For transport companies, one of the major changes to green management may be the modernization of the transport fleet. This modernization should of course be understood as not rejuvenating the fleet (i.e. the purchase of new cars running on petroleum fuels), but most of all retrofitting vehicles with the latest energy solutions. And the

total or gradual elimination of diesel and gasoline cars. Green cars include, first of all, hybrid, electric and hydrogen-powered cars, as well as the increasingly popular V2G (vehicle to grid) cars [28, 29, 30, 31, 32, 33]. Replacing the fleet with the so-called green fleet obviously requires a lot of commitment on the part of the entrepreneur in environmental strategies. Apart from extensive knowledge and ecological maturity, it unfortunately requires quite a significant capital contribution.

As it is easy to see on the market, cars belonging to the prestigious group of green cars are quite expensive investments. For example, class A electric cars often represent a cost similar to a poorly equipped S class car, which unfortunately discourages entrepreneurs. In many countries, in order to break the GTS economic barrier, numerous structural programs are introduced. These programs include quite substantial subsidies (e.g. 30% in Poland) for the purchase of brand new electric cars. For example, the eVAN program has appeared on the European market, the main goal of which is to minimize air pollutant emissions by supporting the purchase of delivery vehicles using electric power. The program includes, apart from the possibility of purchasing electric vans, also the possibility of co-financing the purchase of a charging point with a power of up to 22 kW (without the possibility of providing charging services). At the same time, the conditions for obtaining the subsidy are not very simple.

Therefore, the purpose of this paper is to indicate areas that in logistics companies constitute the basis for bidding a wall against sustainable development (in this case in the use of energy sources).

METHODOLOGY OF RESEARCH

A SWOT analysis was carried out in order to define the strategy related to the development of green vehicles, especially their use in a fleet of various types of logistic enterprises. Usually, this analysis is used to verify the strategic position of enterprises within their operations [34]. However, as many studies have shown, that it can also be used to check the achievement of sustainable development goals [35] or prioritizing sustainable urban regeneration in sensitive areas [36], which points to its universality.

Based on the literature data [8, 9, 15, 37, 38, 39, 40, 41, 42, 43], the main factors for individual groups of the analysis were determined, i.e. strengths, weaknesses, opportunities, threats. Next, assessment and weights were determined for each factor. The assessment of individual factors influencing the strategy was made on a scale from 1 to 5, where 1 means little impact, and 5 very strong impact. The weights signified the importance of individual factors, their sum of weights in each group should be 1. This method was used to balance different numbers of factors in particular groups. The product of assessment and weight for the individual factors was calculated and then summed up in the groups. On the basis of these sums, the strategic position of the strategy related to the development of green vehicles was determined. Subsequently, it was proposed how to use a specific strategy so that it brings the greatest possible effect.

It should be remembered that the conducted analysis is an authorial discussion, which is caused by the debate on the growing importance of the use of green vehicles. It is based on currently available information on the topic under study.

RESULTS OF RESEARCH

The SWOT analysis allows determining the strategic position of the green vehicles strategy in transport enterprises. Tables 1-4 present the classification of each group of factors having an influence on the strategic position related to green vehicles.

Table 1
Classification of strengths of the green vehicles

No	Strengths	Assessment Weight	Assessment-Weight	
S1	A wide selection of electric vehicles	3	0.05	0.15
S2	A possibility of using hydrogen vehicles	3	0.05	0.15
S3	Less noise from electric vehicles	5	0.1	0.5
S4	Less exhaust emissions	5	0.15	0.75
S5	Greater energy efficiency	4	0.1	0.4
S6	Environmentally friendly vehicles	5	0.1	0.5
S7	Improving air quality	5	0.15	0.75
S8	High driving comfort	4	0.05	0.2
S9	Greater energy self-sufficiency in case of the V2G fleet	4	0.1	0.4
S10	Development of green logistic chain	4	0.05	0.2
S11	Increasing Corporate Social Responsibility	4	0.1	0.4
Sum		1	4.4	

Table 2
Classification of weaknesses of the green vehicles

No	Weaknesses	Assessment Weight	Assessment-Weight	
W1	Gas buses without emission standards	2	0.1	0.2
W2	Poor infrastructure for charging electric vehicles	5	0.1	0.5
W3	Higher price (up to 4 times) of green vehicles	4	0.15	0.6
W4	High cost of exploitation of hydrogen and electric vehicles	4	0.15	0.6
W5	Increased lithium demand (costs and mining difficulty)	3	0.05	0.15
W6	Problem with recycling lithium-ion batteries	3	0.05	0.15
W7	Short distance electric cars on a single charge	4	0.1	0.4
W8	Long charging time	4	0.1	0.4
W9	No noise - danger to pedestrians	2	0.05	0.1
W10	No cooperation between vehicle manufacturers	3	0.05	0.15
W11	Various types of chargers for charging electric vehicles	3	0.05	0.15
W12	Poor sales offer if some types of electric cars and buses	2	0.05	0.1
W13	Very low sales of electric cars in Poland	4	0.1	0.4
Sum		1	3.5	

Table 3
Classification of opportunities of the green vehicles

No	Opportunities	Assessment Weight	Assessment-Weight	
O1	Possibility to receive subsidies for green vehicles	5	0.1	0.5
O2	Possibility of new solutions, new technologies	4	0.1	0.4
O3	Standardization of charging systems	4	0.1	0.4
O4	Legal regulations favorable for the development of electromobility	4	0.1	0.4
O5	Social pressure	5	0.05	0.25
O6	Poland's energy policy	4	0.05	0.2
O7	Rapid progress in the production of larger and cheap electric batteries	5	0.1	0.5
O8	Development of public transport based on green vehicles	5	0.1	0.5
O9	Increasing social awareness	5	0.05	0.25
O10	Possibility to create own charging stations up to 22kW	4	0.1	0.4
O11	Greater energy self-sufficiency in the case of own RES	4	0.1	0.4
O12	Increasing the enterprise's credibility - strengthening environmental missions	5	0.05	0.25
Sum		1	4.45	

Table 4
Classification of threats of the green vehicles

No	Threats	Assessment Weight	Assessment-Weight	
T1	Price uncertainty	3	0.15	0.45
T2	Stricter emission standards	5	0.15	0.75
T3	Reduction of the cost of financial support for electromobility	3	0.1	0.3
T4	Large increase in electricity prices	5	0.1	0.5
T5	Unfavorable legal regulations	4	0.1	0.4
T6	Instability of fuel station infrastructure	4	0.1	0.4
T7	Lack of social acceptance due to the use of new technologies	4	0.1	0.4
T8	Difficult forms of crediting and leasing the fleet	3	0.1	0.3
T9	Unprofitable investments in new green vehicles	2	0.05	0.1
T10	Possible changes in energy taxation (unclear legal provisions)	4	0.05	0.2
Sum		1	3.8	

The SWOT analysis allows determining the strategic position of the green vehicles. The strategy that should be taken is shown as the point in the coordinate system (Figure 1). To determine the coordinates of the point, the following calculation was made:

$$Y = |\text{strengths}| - |\text{weaknesses}| = 4.4 - 3.5 = 0.9 \quad (1)$$

$$X = |\text{opportunities}| - |\text{threats}| = 4.45 - 3.8 = 0.65 \quad (2)$$

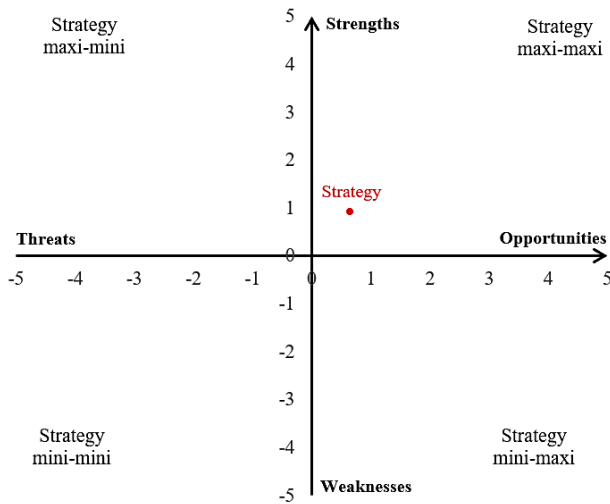


Fig. 1 Strategic position of the green vehicles

Based on the SWOT analysis, it can be noticed that the situation on the green vehicles market for the transport enterprises is characterized by the advantage of strengths over weaknesses and opportunities over threats. This means that the strategic position of the green vehicles is in the first quadrant of the Cartesian system, indicating a maxi-maxi (aggressive) strategy. In this strategy, strengths should be used to maximize the use of green vehicles. Opportunities that can help to maximize the use of strengths should be identified and used. Many factors contributed to these results of the analysis.

DISCUSSION

Among the strengths, the factors S3, S4, S6, S7 deserve special attention. These are all factors associated with the reduced environmental impact of green vehicles. This is what new solutions are created for. It is important from the point of view of the natural environment, which is one of the basic elements of the sustainable development. Only in this way it is possible to make the environment be guaranteed for future generations.

The problem with green vehicles, especially with electric vehicles, is mainly related to the poor infrastructure for charging electric vehicles (W2). Unfortunately, there is still a lot of work to do in this regard, which unfortunately has to be treated as the biggest weakness.

There are many opportunities for the enterprises that decide to purchase and use green vehicles. Firstly, due to the pro-ecological policy in many countries, there is a possibility to receive subsidies for green vehicles (O1). There is a fair development of public transport based on green vehicles, the goal of which is as many electric vehicles as possible on the roads (O8). It may also be influenced by the rapid progress in the production of larger and cheap electric batteries (O7). There is also a second group of important opportunities, i.e. social pressure on environmental protection (O5) resulting from increasing social awareness (O9). By using green vehicles in transport, it is also possible to increase the enterprise's credibility – strengthening environmental missions (O12). This group of factors is important from the environmental point of view in sustainable development.

Among the threats, the most important is Stricter emission standards (T2) and a large increase in electricity prices (T4). The first factor may mean that the vehicles that are currently referred to as green will soon stop being green due to the change of emission standards and another fleet replacement will be required, which unfortunately means new expenses. The large increase in electricity prices and the still unsatisfactory RES in Poland will also increase the costs of use of such vehicles. And yet, in order to achieve sustainable development, it must also include an economic element.

To take advantage of the current situation, certain elements of a maxi-maxi (aggressive) strategy have been identified. This strategy is presented in Table 5. Opportunities should be used to emphasize identified strengths. This study is the authors' discussion on the indicated strategy. This is expected to be a starting point for other authors to consider it in their future research, but it will also lead to a discussion about the future of green vehicles' use.

Table 5 Elements of the strategy

	Strengths (S1-S11)	Weaknesses (W1-W13)
Opportunities (O1-O12)	Possibility to receive subsidies for green vehicles (O1) will allow to invest in a modern fleet, including a wide selection of electric vehicles (S1), and a possibility of using hydrogen vehicles (S2). Possibility of new solutions, new technologies (O2), Possibility to create own charging stations up to 22kW (O10) can have an influence on the greater energy efficiency (S5), greater energy self-sufficiency in case of the V2G fleet (S9), and at the same time will give a wide selection of electric vehicles (S1). Possibility of new solutions, new technologies (O2) can have an influence on the possibility of using hydrogen vehicles (S2). Social pressure (O5) concerning care for the natural environment, which will increase social awareness (O9) will force enterprises to take appropriate actions in the field of environmental protection and reduce the impact on the environment, which will allow for an increase of the Corporate Social Responsibility (S11). Development of public transport based on green vehicles (O8) standardization of charging systems (O3) facilitate the use of electric vehicles, and thus allow for a wider selection of electric vehicles (S1).	
Threats (T1-T10)		Suggested aggressive strategy

CONCLUSIONS

On the basis of the presented results of the SWOT analysis in the field of implementation of the green logistic strategy in transport companies, the following conclusions were drawn:

- subsidies for green vehicles would allow investing in a modern fleet, including a wide selection of electric vehicles, and a possibility of using hydrogen vehicles;
- new solutions (e.g. own charging stations) can have an impact on the greater energy efficiency and energy self-sufficiency;
- increase of social awareness would force enterprises to take appropriate actions in the field of environmental protection and reduce the impact on the environment;
- development of public transport based on green vehicles, standardization of charging systems facilitate the use of electric vehicles, and thus allow for a wider selection of electric vehicles.

Researches on the use of green transport should be widely conducted and discussed. It should be emphasized that this topic fits very well with SDG 7 of the sustainable development, concerning ensuring access to stable, sus-

tainable and modern energy, with an emphasis on international cooperation in research on cleaner energy and technologies in this area, as well as the development of infrastructure and modernization of technologies enabling access to modern and sustainable energy services, including those used in transport.

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