

DESIGN OF GREEN LOGISTICS AUDIT FOR INDUSTRIAL COMPANY TRANSPORT

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Abstract

Logistics involves activities from raw materials processing and transport up to delivery of final products to consumers. One of the logistics roles is to ensure the lowest cost of these activities. In the case of Green Logistics (GL) the factor of maximum environmental friendliness is also taken into account. It's a present world trend, which can help many companies, after timely and successful implementation of the GL principles, to gain a significant competitive advantage in the present globalized and turbulent environment. The potential for an effective implementation of the GL principles can be found in many logistics activities. One of the key areas is the industrial company transport. The starting point of successful implementation of the GL principles can be Green Logistics Audit (GLA). The aim of the paper is to design the GLA methodology for the area of transport in industrial companies.

Keywords: Green Logistics, logistics audit, Green Transportation, industrial company

1. INTRODUCTION

In recent decades, the performance of economic and non-economic activities has required them to be friendly with the environment. This proactive approach to addressing and eliminating the negative environmental impacts from logistic processes is called Green Logistics (GL). GL aims to move and deliver raw materials and products at the lowest possible cost while maintaining the highest standards and minimizing environmental impact in the process [1]. We can understand it as a commitment of the individual components and levels of logistics to seek, implement, maintain, improve and perform logistics processes in such a way to have acceptable impacts on the environment and its individual parts - air, water, soil, natural resources, flora, fauna, and people and their mutual relationships. The acceptable level of relations is set by the legislation, national and international strategic programs, and customers' requirements in the sphere of environment. Environmental impacts must be assessed and controlled in the whole life cycle of monitored product [2].

The potential for an effective implementation of the GL principles can be found in many logistics activities. One of the key areas is the industrial company transport. The starting point for a successful implementation of the GL principles can be Green Logistics Audit (GLA). The aim of the paper is to design the GLA methodology for the area of transport in industrial companies.

2. METHODOLOGICAL BASIS

2.1 Green Transportation

Movement towards GL starts with Green Transportation (GT) [3]. Transportation in the area of logistics processes is one of the areas having considerable potential within the scope of the implementation of the green practices, since it occupies top positions in negative impacts on the environment. At present, the public has been increasingly aware of a number of negative effects transport produces. They include, primarily, the emissions of CO and CO₂ and other exhaust gases, noise, and, last but not least, congested transport infrastructure.

The current goals of GT are now focused on reducing the fuel consumption (which is closely linked to cutting CO₂ and other exhaust gases), reducing noise, reducing the transportation costs, reducing traffic jams and, ultimately, on complying with the legislative restrictions. An active and effective solution of the issues of GT must be seen not only as a challenge, but especially as an opportunity offering the possibility of significant competitive advantage, improving the image of the company in the eyes of the customers, region, state and the general public.

2.2 Logistics Audit

For enhancing the performance of the logistics system, it is necessary to take stock of the efficiency and effectiveness status of various sub-systems of the logistic chain. This process is called Logistics Audit [4].

Logistics audit is conducted to quantify the opportunity for improvement and to prioritize the initiatives in logistics process improvements [5]. Logistics audit is a periodic audit of a firm's logistics system, with the objective of finding an optimal mix of both cost and customer service [6].

Tvrdoň et al. recommend three subsequent parts for logistics audit performance [7]:

1. Descriptive - summarizing and describing all key parameters, measurable values and practice statuses of the logistics corporate system.
2. Diagnostic - the goal is to analyze to what extent corporate logistics systems are optimized or to what extent these systems meet the practical requirements in the specific company environment.
3. Proposal - it is formulated as an action plan, chronologically sorted activities description.

3. METHODOLOGY FOR GLA IN THE FIELD OF INDUSTRIAL COMPANY TRANSPORT

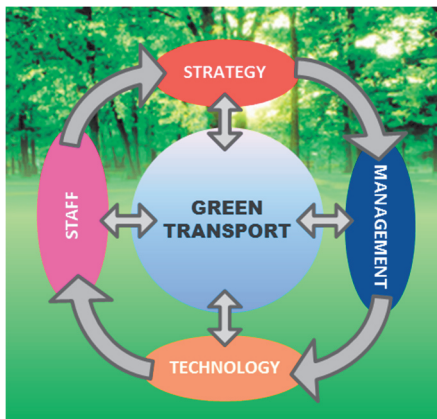


Fig. 1 Fields of the GT best practices

The corner-stone of the proposed methodology is the technique of checklists. Industrial enterprises have two basic practical options how to ensure transport - to have their own car fleet or to use the logistics service providers. A third possibility is the combination of both these options. That is why two types of checklists have been created; taking into account the specific features of both methods of transportation (see **Table 1** and **Table 2**). In case of a combination of their own and external transport, both proposed checklists must be used to perform a GLA.

The checklists were created on the basis of a detailed research of green best practices used in the area of transport. More than 170 best practices have been analysed altogether. The principal sources of information were [8], [9], [10], [11], [12] and [13]. Each question in the checklist reflects one best practice. If the question is answered yes,

the industrial company uses this best practice.

The questions are divided into four areas, reflecting their essential nature (see **Fig. 1**):

- Strategy - best practices creating the basis of a successful application of other best practices or they have the character of supply chain structural changes.
- Management - best practices focused on planning and subsequent execution of transport.
- Technology - technical innovations of the means of transport, equipment, ICT systems and packages.
- Staff - best practices whose motive power is represented by the people and their skills.

Table 1 Checklist for an industrial company with its own vehicle fleet

Field	Question
Strategy	1. Are the key suppliers situated near to you?
	2. Is your transport network optimized from the viewpoint of Green indicators?
	3. Do you have a system of monitoring indicators of Green Transportation?
	4. Do you have created a partnership platform with all stakeholders?
Management	5. Do you use the concept of fully-loaded direct supplies and milk runs?
	6. Do you use the intermodal transport?
	7. Do your suppliers have an agreement for sharing their warehouses?
	8. Do you plan deliveries with your suppliers / customers?
	9. Do you utilize back rides?
Technology	10. Do you use ICT for transport planning and control?
	11. Do you carry out regular optimization of transport capacity utilization?
	12. Do you use alternative fuels and engines?
	13. Do you innovate your fleet?
	14. Do you use software for route optimization?
	15. Do you use road trains?
	16. Do you use double deck vehicles and other two-level systems?
	17. Do you use one-way pallets or other packages for long transports?
	18. Do you optimize loading / unloading time?
	19. Do you use telematics for efficient transport operations?
	20. Do you carry out careful preventive maintenance of your fleet?
	21. Do you have lighter vehicles?
	22. Do you use engine shutdown during waiting times?
Staff	23. Do you have a motivation system for your drivers to behave green?
	24. Do you carry out green training of your drivers?
	25. Do you select new drivers with regard to the green skills?

One of the following options has to be chosen to answer the individual questions:

- 4 points - the company successfully handles the best practice, it form an integral part of the established corporate standards (point value corresponds to 100 %).
- 3 points - the company successfully handles the best practice as a pilot project (75 %).
- 2 points - the best practice has already been executed, but without the anticipated benefits and its execution is still under way (50 %).
- 1 point - the company is preparing the execution of the best practice (25 %).
- 0 points - the best practice is not used by the company, nor is its utilization under consideration at the moment (0 %).

In case a question is not relevant for the examined sectors, it may be excluded from the assessment. If the industrial company uses its own transport fleet, its influence, and hence the number of best practices suitable for application, is higher (see **Table 1**). However, even those companies that want to apply the GT policy offered by the providers of logistic services must actively participate in the transport planning and management process (see questions from **Table 2**).

Table 2 Checklist for industrial companies using providers of logistic services

Field	Question
Strategy	1. Are the key suppliers situated near to you?
	2. Is your transport network optimized from the viewpoint of Green indicators?
	3. Do you have a system of monitoring indicators of Green Transportation?
	4. Do you have created a partnership platform with all stakeholders?
	5. Do you select the logistics service providers with regard to their Green politics?
Management	6. Do you use the concept of fully-loaded direct supplies and milk runs?
	7. Do you use the intermodal transport?
	8. Do your suppliers have an agreement for sharing their warehouses?
	9. Do you plan deliveries with your suppliers / customers?
	10. Do you cooperate in transport utilization with logistics service providers?
	11. Do you utilize back rides?
Technology	12. Do you use ICT for transport planning and control?
	13. Do you carry out regular optimization of transport capacity utilization?
	14. Do you use software for route optimization?
	15. Do you use road trains?
	16. Do you use double deck vehicles and other two-level systems?
	17. Do you use one-way pallets or other packages for long transports?
	18. Do you optimize loading / unloading time?
Staff	19. Do you carry out green training of your logistics staffs?
	20. Do you have a motivation system for your logistics staffs to behave green?

The actual checklist evaluation is performed in three levels:

1. Questions - express the level of implementation of a given best practice.
2. Areas - represent the level of implementation of green practices in the individual areas.
3. Overall evaluation - overall level of GT in the evaluated industrial company.

4. ILLUSTRATION CASE STUDY

A fictitious industrial company using exclusively its own vehicle fleet to ensure its transport activities was chosen to illustrate the application of the proposed GLA methodology. The developed checklist is shown in **Fig. 2**. The graphical presentation of the results is shown in **Figs. 3** and **4**.

Checklist for the industrial company with own fleet					
Strategy	1	Are the key suppliers situated near to you?	3	75%	50%
	2	Is your transport network optimized from the viewpoint of Green indicators?	2	50%	
	3	Do you have a system of monitoring indicators of Green transport?	2	50%	
	4	Do you have created a partnership platform with all stakeholders?	1	25%	
Management	5	Do you use the concept of fully-loaded direct supplies and milk runs?	4	100%	65%
	6	Do you use the intermodal transport?	3	75%	
	7	Do your suppliers have an agreement for sharing their warehouses?	3	75%	
	8	Do you plan deliveries with your suppliers / customers?	2	50%	
	9	Do you utilize back rides?	1	25%	
Technology	10	Do you use ICT for transport planning and control?	4	100%	44%
	11	Do you carry out regular optimization of transport capacity utilization?	3	75%	
	12	Do you use alternative fuels and engines?	3	75%	
	13	Do you innovate your fleet?	3	75%	
	14	Do you use software for route optimization?	2	50%	
	15	Do you use road trains?	2	50%	
	16	Do you use double deck vehicles and other two-level systems?	2	50%	
	17	Do you use one-way pallets or other packages for long transports?	0	0%	
	18	Do you optimize loading / unloading time?	0	0%	
	19	Do you use telematics for efficient transport operations?	1	25%	
	20	Do you carry out careful preventive maintenance of your fleet?	2	50%	
	21	Do you have lighter vehicles?	1	25%	
	22	Do you use engine shutdown during waiting times?	0	0%	
Staff	23	Do you have a motivation system for your drivers to behave green?	3	75%	13%
	24	Do you carry out green training of your drivers?	2	50%	
	25	Do you select new drivers with regard to the green skills?	1	25%	
Overall result = 50%					

Fig. 2 A filled-in checklist of a fictitious industrial company

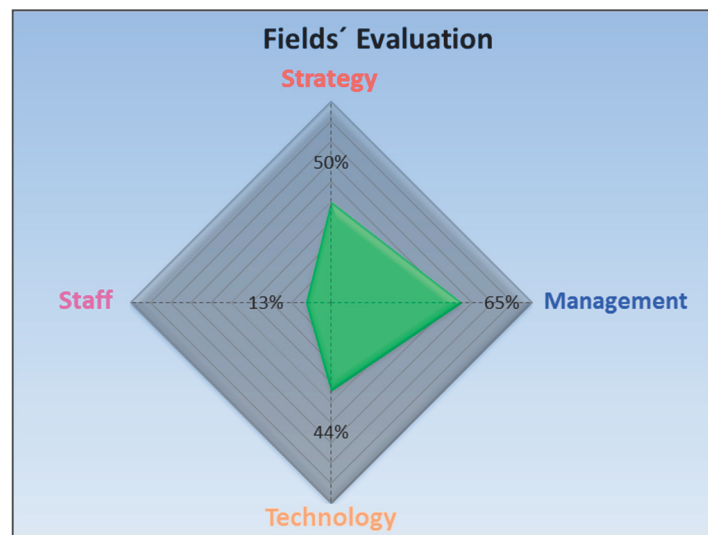


Fig. 3 The evaluation outcome of the audited areas

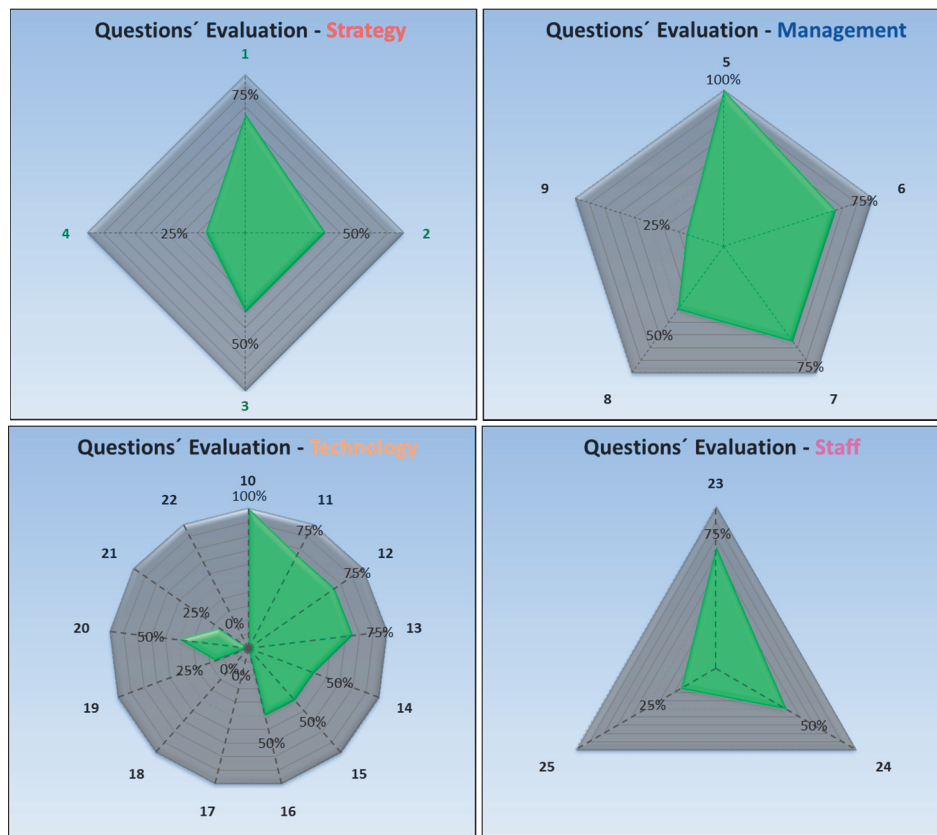


Fig. 4 The evaluation outcome of the individual questions (best practices)

The overall level of implementation of the GT best practices in a fictitious industrial company is 50 %. The best mastered audited area is Management (65 %), the worst is Staff (15 %). The green best practices with excellent rating include the application of fully-loaded direct supplies and milk runs, and implemented ICT for transport planning and control. On the other hand, the green practices that have not been implemented yet include one-way pallets or other packages for long transports, loading/unloading time optimization, and engine shutdown during waiting times.

CONCLUSION

GT is only one area of GL. That is why further research will be focused on creating checklists for other areas. A disadvantage of this procedure is the fact that it does not take into consideration the different significance of the expected benefits and the necessary costs of the audited areas and green best practices. The elimination of this disadvantage will represent another area for future research.

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