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Sustainable logistics: social and environmental aspects. A case study of Dachser

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Abstract

The aim of this article is to determine the effect of supply chain management practice on the ability to achieve environmental and social objectives. A case study approach is used, allowing for deeper analysis as well as making generalizations about complex and multi-layered research problems. The study was conducted at the headquarters and branches of the European logistics provider Dachser in Poland. Areas of research included pro-environmental operations, information technology and corporate social responsibility. The authors develop a theoretical concept of sustainable logistics, using scientific achievements in the field of sustainable logistics and corporate social responsibility, incorporating them into the process of supply chain management.

Keywords: supply chain management, sustainable logistics, corporate social responsibility
JEL M14, Q01, Q56

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Introduction

The modern world economy and socio-economic systems such as the European Union present a huge challenge for logistics, which is counted among the main determinants of economic growth. National economies' increasing dependence on trends in the global demand for consumer and intermediate goods creates new areas for research into logistics and its practical applications. Globalization and the expanding world markets clearly accelerate multidirectional flows of goods and services: intercontinental, regional, domestic and local. With dramatically expanding volumes of shipped goods and services it becomes necessary to expand the linear and point infrastructure and to reduce congestion affecting transport networks. The long-observed relocation of production processes arising from a division of labour model according to which the best locations for mining and manufacturing business should be sought exposes logistics systems to temporary or permanent overload. As a result, logistics models, as well as areas of their application, that might replace the traditional systems in the future are searched for and developed. The engine of the process is consortia and networks consisting of research and development (R+D) centres and enterprises. This combination ensures that new solutions are implemented without unnecessary delay. A relevant illustration is the *Effizienzcluster Logistik Ruhr* project that was set up to develop intelligent and highly innovative models of logistics offering substantial value to customers. Intelligent solutions increase the potential for economic efficiency, as well as having a positive effect on the natural environment and strengthening social ties between part-

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ners participating in the flow of goods and services (Mckinnon et al 2012: 15-22; Sadowski, Szołtysek 2013).

This article aims to determine how practices within supply chain management influence the chain's ability to accomplish environmental and social objectives. The case study discussed in the article provides insights into complex and multi-faceted research problems, as well as an occasion for more general conclusions to be formulated. The presentation is made in the context of scientific achievements in the field of sustainable logistics and corporate social responsibility (CSR) and their use in supply chain management.

Research methodology

For the research carried out, the authors used the case study method[44] (Piekkari, Welch 2011; Ellram 1996). The research has a qualitative character, due to lack of or incomplete quantitative data, making statistical analysis impossible. A deliberate selection of the research sample was made. Due to the range of operation and high level of business practices, this study was conducted in one of the European logistics companies, having offices in Poland. The research was carried out at the headquarters and branch offices of the company Dachser in Poland in the period February - April 2014, using the unstructured interview method. The justification for this choice is that the Dachser network consists of branches located in different countries operate within a homogeneous model. This means that all agencies, regardless of location, base their actions on the same model and possess the same organizational structure. In contrast, in case of, for example, the Raben Group, branches create their own policy, closely related to the location and region of operation. Thus, the results of a survey conducted in Poland may provide a picture of the entire organization, Dachser, which allows for the formulation of conclusions and observations with a higher level of generality. The respondents were both members of the Management Board of Dachser sp. in Poland and managers of individual branches, which made it possible to reveal differences in the perception of activities in the field os sustainable logistics.

The cognitive aim of the study was to identify phenomena and relationships in the supply chain in areas such as: eco-friendly activities and logistics infrastructure, "green" technologies to support the greening of the supply chain as well as activities / services for the local community. The authors focused on the following issues:

- environmentally-friendly solutions related to the operation of terminals,
- compliance with guidelines for energy efficiency and carbon efficiency for office buildings and other structures,
- technical and organizational solutions affecting CO2 emissions in the cross-dock terminals,
- effective use of information systems in the area of transport,
- creation of corporate social responsibility policy at the local level through participation in the education system,
- compliance with the rules relating to environmental protection.

Research questions were formulated from the perspective of the authors' definition of sustainable logistics, which is discussed in the theoretical part of the logistics sustainable.

Sustainable logistics – an attempt at conceptualisation

The concept of sustainability emerged and started to be developed because of the perceived imbalance of regional and local ecosystems. The imbalance was initially limited to particular geographical areas, but over time it has turned into a global problem affecting most regions in the world. The available statistics on CO_2 emissions, amounts of waste and noise levels show that the global ecosystem will not regain its sustainability unless the present, linear model of management processes is replaced with a closed-loop model (see IPCC 2014).

[44] Case studies are often used in research on management issues, including supply chain management when insufficient quantitative data are available or data are incomplete (see Piekarri, Welch, 2011; Ellram 1996).

Before the options available to restore sustainability to the global socio-economic system can be considered, it is necessary to understand the nature of human existence and of human economic activity that tends to make the most of the environment. A one-way relationship between humans and ecosystems where the former gain all benefits is typical of a growth economy and represents the essence of classical economics and of traditional management concepts. This means that in order to restore sustainability the relationship between an ecosystem and the socio-economic system in place must be profoundly remodelled by introducing a degrowth economy characterised by temporary deceleration of economic processes, the use of advanced manufacturing and IT technologies, more efficient use of raw materials and energy, and a different view of human resource management on interpersonal relations.

Many scientific disciplines, including logistics and supply chain management, have noted a change in the attitude to global problems haunting the environment, such as increasing amounts of waste, global warming or decreasing biodiversity. In the 20th century many overlapping concepts and theories about specific environmental issues were developed, e.g. recycling logistics, eco-logistics, waste logistics, green logistics or reverse logistics. In addition to these concepts that directly address the environmental problems there are also others that deal with ecosystems indirectly (social logistics, public logistics and urban logistics, etc.) and enhance the basic set of concepts for solving environmental problems.

The multitude of environmental views and approaches to the environment operated within logistics causes problems with their classification and with establishing what they are really about. The overlapping of logistic concepts makes it necessary to synthesise and standardise the theoretical output of logistics on environmental protection.

One way of reconciling the abundance of co-existing concepts that in fact deal with the same environmental problems is sustainable logistics, which can be viewed in terms of:

- an approach in which the set of three pillars of logistics (physical flows, information and finances) is extended to a fourth one: broadly understood environmental protection. This approach comes with a major re-definition of logistics theory, paradigms, mission, principles, objectives and tasks.
- a solution involving the use of innovative and green transportation and telematics technologies to mitigate the negative impacts of logistic companies in the TSL sector (transport, forwarding and logistics).
- the integration of environmental concepts and views related to economic logistics. A sustainable model of management processes requires also different processes in the flows of goods and services.
- a shift in companies' operational focus towards compliance with environmental and transportation laws, and with other mandatory norms and rules.
- one of the key elements of CSR philosophy and principles, with CSR being understood as voluntary actions taken by organisations towards sustainable economic development.

These different approaches cause that studies on reverse logistics vary in content and form. The same is true about the range of problems presented in the framework of sustainable logistics.

Sustainable logistics, like general logistics, can be considered in three dimensions:

- Conceptual and functional
- Organisations and physical flows
- Cost-effectiveness

The first dimension of sustainable logistics concentrates on accounting for the environmental and social impacts of logistic processes and reverse logistics in the management of the flows of goods and services. Decisions about logistics activities are taken in line with the philosophy of sustainable development and its objectives (Bretzke, Barkawi 2013).

The second dimension consists of physical processes in the flows of goods and services that form a network. In this case, sustainable logistics is intent on using environmentally-friendly vehicles, technologies and transportation systems, and on implementing IT solutions to support processes.

The cost-effectiveness dimension is focused on meeting customers' demand for goods and services in an environmentally-efficient man-

ner. It involves the use of measures that evaluate the purely economic aspects of logistic processes, but also their environmental and social impacts.

These three perspectives on sustainable logistics cause that neither the term 'sustainable logistics' nor areas of its application have been precisely defined so far. For instance, the authors of *Sustainable Logistics* provide thirty research hypotheses on sustainable logistics.

Because of the general principles of logistics, sustainable logistics is, naturally, also perceived as a holistic solution enabling environmentally-safe flows of goods and services. In other words, sustainable logistics is a system where processes in the flows of goods and services are designed and managed in such a way as to prevent all negative environmental and social impacts they might produce. Sustainable logistics addresses all aspects of the flows and areas of where logistics is applied. Its primary aim is to ensure high environmental efficiency of logistics process, while gaining social acceptance for them.

The socio-environmental aspects of sustainable logistics. A case study of Dachser.

CSR policy expects of entrepreneurs to behave responsibly and ethically towards the public. It can be observed that over the years, entrepreneurs' attitudes to social responsibility have clearly changed. Less and less often annual charity collections among company's personnel and the cleaning up of green areas organised in hope that the media will cover the event and that the company's image will quickly improve as a result are the only manifestations of CSR. Today, many firms consider CSR to be a consistent and comprehensive approach to their setting and the appropriate business philosophy. This perception of CSR is increasingly often built into firms' strategies of growth, but in the first place it becomes part of their daily routines, from the organisational attitude and appropriate handling of human resources to the creation of organisational culture in the spirit of social responsibility (Iqbal, Khattak 2010: 102-106).

CSR solutions change in time and form trends. As recently as 20 years ago topics such as organisational culture were not widely discussed in Poland. The role of an enterprise, too, was perceived very differently – its impacts on the natural environment and the setting attracted much less attention than today. CSR activities were not defined and compiled into a single document laying out organisational standards and regulations. The emerging changes are driven by rising awareness, positive imitation and the absorption of corporate standards in Poland (Forum Odpowiedzialnego Biznesu 2014).

CSR activities carried out in an honest and consistent manner have a strong influence not only on the company's setting but also on its image, its perception by the business partners and customers, and on its market position in the long run. CSR is not only about being fair in business, it is also an investment in the company's future, as customers are likely to seek cooperation with responsible organisations that achieve good financial results, use transparent practices to manage their business and foster stable relations with their setting (van de Loo 2010: 14-22).

The business of a logistics operator is special because of its influence on the natural environment, neighbourhood, and the quality of life of local communities. Dachser is a global logistics operator that undertakes many CSR initiatives at both corporate and country and branch levels. Drachser has implemented sustainable logistics in the following areas.

Pro-environmental activities. Investments in environmentally-friendly solutions frequently involve additional financial outlays. The solutions are mainly implemented to reduce operating costs and to improve the economic result of the organisation, but also to mitigate the impacts of the logistics business on the environment (Göbl Froschmayer 2011: 112-119). Seeking measures that reduce costs while benefitting the environment is by all means a rational approach.

Infrastructure. As in the case of any other logistics operator, Dachser's core business is based on capital assets that constitute an important element of customer service and enable the proper delivery of services. Dachser's infrastructure consists of a network of its own cross-dock terminals and freight transport vehicles that travel between them on a daily

basis. The company operates a global network of 471 branches in 42 countries and uses over 10.000 swap bodies to deliver transport services. In Europe alone, Dachser handles each day almost 4000 regular transport connections between its branches. In 2013, 70 million shipments went through its network.

Terminals. In sustainable development, environmentally-friendly and energy-saving construction technologies play a major role. Dachser builds all its new branches in conformity with the most stringent environmental and energy standards. To ensure that its facilities are energy-efficient, thicker layers of insulation are applied than those required by mandatory standards for comparable structures.

Terminals with temperature-controlled environment are protected against the loss of cold air by special inflatable seals fitted around the gates (pic.1). Lighting systems making use of energy-efficient light sources are controlled both inside and outside logistics facilities and offices. The quality of lighting is improved by a large number of skylights fitted in warehouses that reduce the need for using artificial lighting. In most Dachser's own facilities precipitation water is collected for "household" use and to water green areas in periods when rains are few. To cut CO2 emissions as much as possible, battery-powered forklifts are used to handle goods in warehouses. Waste management also complies with strict standards, with much attention being given to waste selection and recycling. For the sake of illustration, plastic scrap film is used to fill special coarse-cloth bags (pic. 2) that are then used to protect goods in transit.

Office buildings. Dachser makes a point of using environmentally-friendly and energy-efficient technologies to construct its office buildings, and of heating them by systems that recoup heat from installations. By recovering heat generated by the server room at Dachser's headquarters in Kempten, Germany, the demand for heat was reduced by over a half. All new office buildings are fitted with low-emission window panes that prevent the loss of heat but allow solar heat to pass through inside.

To reduce energy consumption, windows are fitted with automatic blinds that relate the amount of sunshine getting into the building to weather conditions. This solution practically eliminates the need for cooling systems to be used. The installation of state-of-the-art lighting systems connected to automatic room control and using low-energy light sources, including LED and metal-halide light sources that are very efficient and emit almost daylight colour light, also allows energy to be saved.

Environmentally-friendly technologies. At Dachser, goods for shipment are consolidated in cross-docking facilities, which largely reduces the number of vehicles necessary to deliver them. The consolidation of goods is given much attention already at the stage when processes and the entire chain of supply are being planned. Because many shipments are held in the same place, it is much easier to choose the most efficient way of loading them by destination (goods can be consolidated by destination or by customer). In all countries, Dachser's customers have access to the same range of services (products). One of them is the storage of one type of goods if the route vehicle is already packed to capacity. This approach and the customers being able to choose a less expensive service prevent situations when vehicles would carry less freight than they could. Because vehicles are loaded to capacity, average CO_2 and NO_x emission per shipment are much lower than if traditional solutions were used.

Practically all route vehicles can handle swap bodies in which goods can be loaded on two levels. In this way the freight space is used much more efficiently (pic. 3,4). Assuming that the freight is perfectly distributed, a set of two swap bodies can hold 76 full Euro-pallets, as opposed to a traditional semitrailer of 13.6m in length that can receive only 33. Another advantage is that swap bodies can be interchanged between vehicles. Two swap bodies bound for the same destination can be separated at any point en route and, after being attached to swap bodies that came from other branches, redirected to a different destination. All these solutions have been implemented to use the fleet of vehicles as efficiently as possible and thereby to ease their burden on the environment.

With the exhaust gas emissions standards being tightened up and tax policies being developed to encourage compliance, shipping companies increasingly choose vehicles powered by the most efficient engines that are not only less costly to operate but also easier to sell at later time. The electronic toll collection system Poland has implemented, viaTOLL, also favours vehicles fulfilling the strictest exhaust emission standards, because the amount of toll has been set to increase with vehicle's age. As estimated, over a distance of 100,000 km a difference in tolls may be as much as 6,000 Euro. This fact encourages many companies, including Dachser, to use environmentally-friendly vehicles meeting Euro 5 and 6 standards.

Dachser has implemented electronic Transport Management Systems (TMS) to control all its operations. Staff in terminals are aided by comprehensive and advanced IT solutions that prepare the best layout of goods in the container, monitor vehicles in transit and optimise their routes so that shipments can be delivered by possibly few vehicles using the shortest routes and thereby consuming minimal amounts of fuel. All this would not be possible without TMS systems collecting and processing specific data.

Electronic Data Exchange systems at Dachser ensure timely and precise distribution of information. All information exchange and communication processes are handled electronically. As a result of Dachser's determination to cut back on the use of paper, 90% of correspondence with customers and inside the corporation are distributed via electronic systems. Information generated at all stages of logistic processes is stored on optical discs. Rather than stand-alone computers, branches use network terminals that consume less energy. Data are safely stored at the corporate Data Centre which is part of Dachser's headquarters. Only battery-powered forklifts are used to handle goods in terminals and warehouses.

Supporting local communities. Dachser is a global corporation that conducts its core business through a network of branches located in 42 countries that support initiatives in aid of local communities. Sometimes assistance is offered at the corporate level. A case in point is Dachser's cooperation with Terres des Hommes, an organisation promoting children's education in India. Dachser has spent to date 900 000 euros to help people living in the region of Uttar Pradesh, as a result of which 90% of local children could go to schools. Dachser Poland also supports local communities and people in need by partnering in various projects and organizing collections among its personnel.

Dachser is committed to the development of young people. As part of its cooperation with the Chair for Sustainability in Logistics and Supply Chain Management at the European Business School, Dachser finances research on sustainable development, particularly on its logistic aspect. The corporation takes efforts to raise the awareness of the significance of cooperation with employees and customers. It promotes knowledge and competencies, as well as professional, social and leadership skills. Dachser has founded its own Academy in Cologne, Germany, and takes an active part in creating and implementing curricula for studies in logistics. Dachser Poland finances a scholarship programme for young talents studying at the Berlin School of Economics and runs its own programme of two-year internships with the corporation. It regularly cooperates with higher education institutions, such as the University of Łódź and the Poznań School of Logistics. Its cooperation with the Poznań School of Logistics has resulted in a new formula of dual studies that integrate theoretical learning with hands-on experience and so they better prepare the students for their future jobs. Young people choosing these studies alternately participate in classroom activities and take internships in company's branches.

Dachser believes that its main asset is human resources and so it takes special efforts to create a sense of community and to take care of the well-being of all employees. Its personnel are not only trained in carrying out their job-related duties, but are also provided with access to corporate health programmes, etc..

Running a business along the lines of sustainable social development has become more than a fashion today; it is also a way to manage a modern company. More and more customers seek environmentally-safe products

that are made in an environmentally-safe way. Organisation's commitment to environmental protection frequently becomes a criterion for selecting a business partner. Many calls for tenders require the tenderers to use specific pro-environmental solutions.

Pic.1. Inflatable dock seals protecting against internal temperature changes.

Source: Authors.

Pic.2. Bags filled with packaging film scrap to protect goods in shipment.

Source: authors.

Pic.3. Swap bodies in loading docks.

Source: authors.

Pic. 4. The two-level distribution of freight in a swap body.

Source: authors

Conclusion

While many research papers are being published these days on sustainable logistics that sets the direction for strategic changes in supply chain management, it is still very difficult to indicate what properties of the chain (regarding its architecture, processes and activities) make it sustainable. The strong interaction of theoretical concepts, definitions, approaches and terms related to sustainable logistics seriously impedes research in this field.

The in-depth analysis of sustainable logistics based on the case of the global logistics provider Dachser has indicated the main characteristics of a business model capable of offsetting the social and environmental impacts of logistics operations. The characteristics form a reference framework that can be applied to identify whether business models operated in various industries actually meet the criteria of sustainable logistics. These are:

- the type of infrastructure,
- the type of vehicles,
- IT control over the flows of goods,
- activities on behalf of the company's personnel, pupils, students and local communities,

- the use of technologies protecting natural resources,
- compliance with the strictest environmental standards applying to logistics.

Companies differ in the ways of implementing the characteristics. Some of them seem not to have started the process yet. This means that companies represent different stages in the development of sustainable logistics, partly because of their corporate culture and the organizational, environmental and social awareness of their managers.

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Zrównoważona logistyka: społeczne I ekologiczne aspekty. Studium przypadku Dachsera

Abstrakt

Celem artykułu jest określenie wpływu stosowanych praktyk zarządzania łańcuchem dostaw na zdolność do osiągania celów ekologicznych i społecznych łańcucha dostaw. W badaniach zastosowano metodę studium przypadku, która umożliwia zarówno analizę jak i dokonywanie uogólnień w odniesieniu do złożonych i wielowarstwowych problemów badawczych. Badanie zostało przeprowadzone w siedzibie i oddziałach europejskiego przedsiębiorstwa logistycznego Dachser sp. z o.o. w Polsce. Wśród obszarów badawczych znalazły się działalność proekologiczna, technologie informatyczne oraz społeczna odpowiedzialność biznesu. W warstwie teoretycznej autorzy dokonali konceptualizacji logistyki zrównoważonej proponując własną definicję. Tłem do przeprowadzonych badań są osiągnięcia naukowe w zakresie rozwoju logistyki zrównoważonej oraz społecznej odpowiedzialności biznesu i włączenie ich do procesu zarządzania łańcuchem dostaw.

Słowa kluczowe: zarządzanie łańcuchem dostaw, zrównoważona logistyka, społeczna odpowiedzialność biznesu