

MULTIMODAL TRANSPORT MANAGEMENT - IN SEARCH OF SUSTAINABLE EXCELLENCE

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Abstract

One of the most important business trend influencing future competitive - and so the strategic decisions - is sustainable development. Sustainability means the ability to take activities that meet pro-ecology, pro-social and economic objectives. One of the solution meeting the needs of enhancement of ecological sustainability is multimodal transport development. The aim of the paper is to present part of the results of the ChemMultimodal project that is under the development of the Interreg Central Europe Program. Presented results show part of the available methods and open-access tools for transport CO₂ emission calculation. The study consists also of the results of the market research on multimodal usage and CO₂ emission measurement within researched companies engaged in chemical supply chains in Poland. These results have been compared with companies' declarations of corporate social responsibility and sustainable development strategy implementation. Majority of the respondents do not use multimodal transport and do not measure CO₂ emission in transport operations. Additionally there is lack or minor interest in CO₂ emission measurement in the future even if the companies declare susutainable strategy implementation. It might be caused by minor proportion of CO₂ emission in transport in comparison to total CO₂ emission by researched chemical companies. The other argument was that there are no regulatory requirements for such an activities. Therefore when analyzing whole activities of the company - and so also within its supply chains - some divergences and lack of consistency on operational, tactical and strategical levels might be observed.

Keywords: Multimodal transport, transport sustainability

1. INTRODUCTION

Currently one of the most important trend influencing future competitive business models scenarios - and so the strategic decisions - is sustainable development. Sustainability means the ability to take activities that meet pro-ecology, pro-social and economic objectives. However to gain competitiveness by sustainable development the company should remain consistent in terms of operational, tactical and strategical level activities. Consistency means being able to make operational and tactical daily-basis decisions in line with the supply chain - and so the company's - strategy.

Freight transport is important for sustainable development. It can play significant role in terms of achieving competitive advantage. However it rarely comes up against the objectives of sustainable development. If the company strives to achieve consistency on operational, tactical and strategical level in terms of sustainable strategy implementation it should revise introduction of ecological transport modes into the supply chain. One of the solution meeting the needs of enhancement of ecological sustainability is multimodal transport development. However to gain strategic goals the specific Key Performance Indicators (KPIs) should be settled. One of the most obvious and important KPI is CO₂ emission measurement and comparison for different types of transport modes.

The aim of the paper is to present part of the results of the ChemMultimodal project that is under the development of the Interreg Central Europe Program. The project's goal is to promote multimodal transport in chemical logistics in Central Europe. Presented results show part of the available methods and open-access tools for transport CO₂ emission calculation. The next part of the study consists of the results of the market research conducted within companies engaged in chemical supply chains. These results have been compared

with their declarations of corporate social responsibility (CSR) and sustainable development strategy implementation. The research was conducted within companies operating in Central Europe during August and September 2016. In the paper the special attention is dedicated to Polish chemical industry solutions.

2. SUSTAINABLE SUPPLY CHAIN MANAGEMENT - THE CASE OF MULTIMODAL TRANSPORT

Companies have become more deeply interested in implementing CSR programs and activities supporting sustainability [1]. The idea of sustainable management of the company - and as a consequence sustainable supply chain management (SCM) - has become a strategic factor for companies worldwide [2]. The concept of sustainable supply chain management (SSCM) has arisen. SSCM is defined as reformist SCM “which manages the material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e. economic, environmental and social, into account which are derived from customer and stakeholder requirements” [3]. Companies’ improvements of sustainable supply chain performance (SSCP) can sharpen their competitiveness and financial and operational performance. SSCP is a company’s capacity to reduce the use of materials, energy, or water and to find more eco-efficient solutions by improving supply chain management [4]. Additionally performance should be measured to determine the efficiency and effectiveness of an existing system or to compare competing alternative systems, unable continues improvement, benchmarking, as well as being an important “support” in the planning, design, implementation and monitoring of systems [5]. According to Björklund *et. al.* some of the most frequently reoccurring environmental measurements are: air emissions, energy use, recycling, fuel use and water use [5].

At the same time several researches describe the main characteristics of management decisions made on the three managerial levels. Changes on strategic top level cover infrastructure planning (i.e. additional facilities, locations and make/buy decisions) and are characterised by long time horizons. Tactical decisions are made by middle level management and include i.e. capacity planning and utilisation of the equipment. Decisions made on operational level management concern matters such as scheduling and routing [5]. It must be underlined, that there is a need for vertical integration between levels as tactical decisions are the base for operational and finally influence on the level and quality of strategic plan fulfilling. If the strategy is well introduced within the partners in supply chain than logistics or transport managers are able to adapt appropriate transport modes and tactics for transport management.

Within transport activities there are several options that can support sustainability in supply chains. For example the World Forum and its subsidiary Working Parties have already considered a large number of measures to improve the energy efficiency of the vehicle fleet. There are especially: innovative engine technologies, advanced engine management systems, efficient vehicle powertrains, the use of other alternative energy sources such as liquefied petroleum gas (LPG), compressed natural gas (CNG) and sustainable bio-fuels (liquid and gaseous, development of quality specifications for market fuels in relation with the vehicle emission levels and engine technology type, installation electric devices on vehicles of with a low energy consumption to reduce the energy consumption or development of Intelligent Transport Systems (ITS) [6]. However the most significant impact on sustainability in supply chain has the behaviour of managers and their daily-based decisions that should fulfil the strategy. In terms of transport activities managers can improve quality of transport-intensity activities. Therefore the following steps can be taken [7]: review product design and bill of materials (materials characteristics, possibility to recycling or reuse), review sourcing strategy (especially low-cost country due to the distance), improve transport utilization (empty loading spaces limitation), use postponement strategies (product customization can be finalized near point of use), review transport options (choosing eco-friendly transport modes, design vehicles and vessels, etc.). As the result of review transport options the multimodal solution for SSCM can be deeply revised.

Multimodal transport is “carriage of goods by two or more modes of transport” [8]. In most of the cases multimodal transport concerns the *door-to-door* approach.

Multimodal transport can support SSCM in many different ways. This is due to the fact that in most of the cases multimodal transport consists of rail (or inland) mode. The railway is characterised by low costs but high volumes (economies of scale). This conditions supports competitive supply chains in terms of economic performance. Additionally using railway for most of the route brings positive effects on pollution. Therefore multimodal transport has a great potential for supporting companies and whole supply chains with implementation of CSR and sustainable development strategy. That influences also on quality of inhabitants' life. However for conscious decisions managers should set appropriate method of measurement of CO₂ emissions when analysing transport modes and their impact on pollution.

Transport environmental impact might be measure at least by two types of methodologies [9]:

1. Energy-based approach (when there is an access to energy and/or fuel consumption data). CO₂ emission is calculated as the quotient of fuel consumption and fuel emission conversion factor.
2. Activity-based calculation method (when there is no direct access to energy or fuel consumption data). CO₂ emission is calculated as the quotient of transport volume by transport mode and average transport distance by transport mode and average CO₂ emission factor per tonne-km by transport mode.

Additionally companies can easily use an open-access CO₂ footprint calculators available on-line. The most popular is EcoTRANSIT World [10] tool that is used by many Logistics Service Providers (LSP) and is based on European standards (EN 16258). It enables CO₂ emission calculation for routes that uses road, rail, sea or air modes. This solution is used by most multinational European transport companies. However there are also other calculators available on-line like NTMCalc Freight, Climate care or LOG-NET.

In terms of appropriate CO₂ emission calculation and comparison between different types of transport modes some additional factors should be considered. For example the distance between point of departure and destination might differ, volume of loading also might be important, type of engine, driver's skills in terms of eco-driving or transports frequency. Those factors might influence on CO₂ emission level. On the other hand those factors might also impact on price and transit time. Those aspects are then one of the most important elements in terms of economic approach to changing transport modes on particular route. However it must be reminded that the supply chain strategy is the point of reference for the choice of transport mode. Therefore if company implements CSR or sustainable development strategy, the supply chain operations should reflect it in daily-basis activities.

3. CHEMMULTIMODAL PROJECT - MULTIMODAL TRANSPORT FOR SUSTAINABLE DEVELOPMENT IN THE EUROPEAN CHEMICAL SECTOR

ChemMultimodal project is implemented for promotion of multimodal transport of chemical goods. The Project aims to achieve this by coordinating and facilitating cooperation between chemical companies, specialized LSP, terminal operators and public authorities in chemical regions in Central Europe. The Project is carried out under the Interreg Central Europe Program between June 2016 and May 2019.

The first part of the Project concentrated on diagnose on how physical flows of chemical goods are managed and what kind of tools are used in supply chain to support smooth and continues flows. This information is a base for a tool development that aims to promote increasing in multimodal transport usage. Project is conducted in seven countries or regions in Central Europe by fourteen Partners. All the Project's activities are performed simultaneously in all Partners' countries.

In Poland Project is implemented by Warsaw School of Economics (SGH) and Polish Chamber of Chemical Industry. In the first phase of the Project the research was conducted within 49 main market players. It took place between August and September 2016. There were two groups of respondents invited to the study - chemical producers and LSPs that cooperate with producers or within chemical supply chain in Poland and abroad. Finally, 22 questionnaires were filled in - 13 by chemical producers and 9 by LSPs. Part of the

questions were dedicated to identify the share of the multimodal transport usage and practices of CO₂ emission measurement. Additionally the interest of using tools for CO₂ emission calculation was analyzed.

In general chemical companies use multimodal transport rarely. Its average share in relation to other models is on the level of 15%. Transport of chemical goods takes place in Poland mainly through the use of road transport, which accounts for around 57%. The rest of the transport is carried out using rail and sea transport modes. In principle inland transport in Poland is not functioning. LSPs use multimodal transport mainly according to the clients' requirements that are the base for creating portfolio of services. Those requirements concern in most of the cases short lead times and low costs. The modes of the transport is not the priority.

Among the companies which reply to the question concerning the measurement of CO₂ footprint of transport operations 68% indicated that they do not measure this value. Only three companies admitted that they measured CO₂ emission in transport operations. Within the reason for not to measure CO₂ emission companies informed that i.e. „*We do not have own fleet, we use outsourcing*”, „*Fees for emissions calculation are flat rate*”, „*Goods are delivered directly to the customer*”, „*We do not have equipment for measurement*”, „*There is no need*” or „*There is no possibility*”.

However, there is a slight difference between responses from chemical companies and LSPs. First of this group is less engaged in measurement of CO₂ emissions in transport operations. 77% of chemical companies that were researched do not measure this indicator. This might be mainly due to the fact, that transport is not their core competency and the logistics costs are not that high to pay more attention. The lower percentage of companies that do not measure CO₂ emissions may be observed in the LSPs. 56% of them do not measure this indicator in their transport daily operations.

Only 14% of researched companies acknowledged that they measure CO₂ emission in transport operations. One LSP company admitted that they measure CO₂ emission and have their own system that is able to calculate emissions divided per different type of transport modes.

However as much as 50% of LSPs and 56% of chemical companies are not interested to calculate CO₂ savings on transport and modal shift in the future. Those replies clearly state that companies do not have motivations for such an activities yet - neither as 'penalties' (i.e. due to the lack of regulations) nor as 'incentives'.

As mentioned in the previous section, transport management activities fall within the scope of tactical or operational levels' responsibilities. And those should be the result of the adopted and implemented supply chain strategy. This strategy again should be consistent with the company's strategy. According to the information indicated by the analyzed companies it could be observed that most of them declare implementation of CSR and/or development of sustainable strategy. 68% of the companies stated that they carry out such activity and do care for natural environment. This is primarily the domain of the chemical industry. 92% of chemical companies declare that they provide that kind of activities, implement CSR and/or sustainable development strategy to save natural resources and reduce pollution. However they concentrate such activities mainly within production tasks. Therefore when analyzing whole activities of the company - and so also within its supply chains - some divergences and lack of consistency on operational, tactical and strategical levels might be observed.

The situation is different in the LSPs' CSR and/or sustainable development strategy declarations and implementation context. One LPS who implements sustainable development strategy simultaneously declares CO₂ emission measurement. Next five companies who do not implement CSR or sustainable development strategy at the same time do not measure CO₂ emission within their transport activities. While such a consequence might be recognized positively, the question is why LSPs are still not interested in implementing a sustainable development strategy. Surprisingly they do not even offer customers CO₂ emissions calculation that could support the measurement of the implementation of their strategies, even if there are not too many of them.

When examining replies to the same questions from respondents from other countries, the situation is similar. For example respondents from Austrian chemical sector indicated that none of the chemical companies, who were questioned, use CO₂ calculators regularly because it makes up a minor proportion of their total CO₂ emission. However statements of the chemical companies though, show potential for future use as importance of emissions will increase. In Italy researched chemical companies and LSP also do not measure CO₂ emission except for one LSP cargo division who uses platform for CO₂ emissions - EcoTransit World. In Hungary two respondents measured CO₂ emission - they are LSPs.

One of the ChemMultimodal Project's next objectives is to develop, share and disseminate easy tool for supporting multimodal transport usage. This tool will consist of CO₂ emission calculator, planning guidelines supporting multimodal transportation decisions, visualization of the freight flows and consulting services for assisting operational and tactical activities. It will be tested by the companies between 2017 and 2018.

4. CONCLUSIONS

Companies have become more deeply interested in implementing CSR programs and activities supporting sustainability. Therefore the concept of SSCM arose. It is based on managing the material, information and capital flows with respect to economic, environmental and social requirements. Multimodal transport can support SSCM in many different ways. This is due to the fact that in most of the cases multimodal transport consists of rail (or inland) mode that is environmental friendly. It might also influence on costs level.

The introduction on ChemMultimodal Project is supposed to lead to increasing of multimodal promotion and usage within chemical supply chain in Central Europe. This project is carried out under the Interreg Central Europe Program between June 2016 and May 2019. The first part of the Project concentrated on diagnose on how physical flows of chemical goods are managed and what kind of tools are used in supply chain to support smooth and continues flows. There were two groups of respondents invited to the study - chemical producers and LSPs that cooperate with producers or within chemical supply chain in Poland and abroad. According to the research results, multimodal transport is still not popular transport mode in chemical supply chains in Poland. It is used on average in 15% of all of the transports. Additionally 68% of respondents indicated that they do not measure CO₂ emission in transport operations even that transport environmental impact might be measured by an open-access CO₂ emission calculators available on-line.

More than a half of companies are not interested to calculate CO₂ savings on transport and modal shift in the future. Those replies clearly state that companies do not have motivations for such an activities yet. However most of respondents declare implementation of CSR and/or strategy of sustainable development. Therefore when analyzing whole activities of the company - and also its supply chains - some divergences and lack of consistency on operational, tactical and strategical levels might be observed. That leads to the conclusion that implementation of sustainable development strategy should be revised in terms of its ability for introduction on operational level, i.e. within transport activities. Additionally the tool supporting multimodal transport activities might help managers to revise potential of competitiveness increasing by multimodal introduction on operational and tactical levels. This is the goal of ChemMultimodal Project implemented under Interreg Central Europe Program.

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ChemMultimodal

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