

Freight transports and the Market Challenges for Achieving Sustainable Mobility

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Despite the current recession in Europe, the demand for freight transports is very strong. The transport sector has become a heavier polluter of the environment in the last two decades due to increased freight transports, especially on road. In Europe, the growth rate is particularly strong regarding freight transports on road. This implies direct environmental, negative effects (e.g. increased congestion, emissions of air pollutants and accidents), but also indirect effects of carbon dioxide and global warming.

There are several challenges how to steer the transport pattern into a more sustainable one. The policy side is one thing but at the same time, there are various initiatives and forces on the market of transport services. The increasing demand for more sustainable freight transports among transport-buying companies, in Sweden but also in other European countries, is a reality for many logistics service providers today. The transport sector is a highly competitive one where the competition on prices is keen. The transport providers now struggle with the challenge of meeting this demand.

The purpose of this paper is to identify the challenges facing the transport providers based on changes in the demand concerning environmental aspects, but also the opportunities for these transport providers that are proactive. The policy area is not in focus in this paper, rather a market-driven view of the freight transport sector. Results from a qualitative study and a large survey among transport buyers are used, but also the experience of research within this area since 2001.

This paper shows that logistics managers in transport buying companies evaluate different aspects when transports are bought and have also worked at an inter-organisational level. Transport providers have to relate to this and take measures rapidly. The large ones have done attempts to offer environmentally better transport services, as shown in this paper. The question is if these market mechanisms can be developed to be effective soon enough in relation to the immediate need of reduction of CO₂. If not the transport industry probably will face policy interventions.

Key Words: Green logistics, marketing of freight transports, sustainable transports, transport buying, environmental aspects, market challenges, market for green logistics

1. Introduction

Traditionally, nations were competitive when their companies had access to inputs (capital, labor, energy and raw materials) to the lowest cost. Porter and Van der Linde (1996) put forward that competitiveness today is obtained by using resources more productively, where companies produce existing products more efficiently, or by making products that are considered more valuable to customers and that customers are willing to pay more for. They claim that how an industry responds to environmental problems may be a leading indicator of its overall competitiveness. This paper focus on the freight transport industry and the measures used for reducing the negative environmental impact today, with examples from mainly Sweden. The future competitiveness of the industry is at stake.

Despite the current recession in Europe, the demand for freight transports is very strong. The transport sector has become a heavier polluter of the environment in the last two decades due to increased freight transports, especially on road. In Europe, the growth rate is particularly strong regarding freight transports on road, while rail transports are still on a stable, low level (European Communities 2003). In Europe today, road transports account for 73% of total land freight transport performance in ton-kilometres. Its' growth rate is particularly strong growing faster than GDP with an annual growth of 4.9% (European Union 2009). This implies direct environmental, negative effects (e.g. increased congestion, emissions of air pollutants and accidents), but also indirect effects of carbon dioxide, lading to global warming. The European Union has stated that continued growth in traffic is not compatible with sustainable development and that the transport sector must decrease emissions of green house gases. There are also several practices causing "excessive" freight truck traffic (e.g. empty running or sub-optimal modal choice), where the most obvious way of minimizing this excessive use is to apply the "Polluter Pays Principle" and internalize its social and environmental cost (McKinnon 1994). This is a measure that is discussed among policy makers in the European Union.

There are several challenges how steer the transport pattern into a more sustainable one at the policy side. However, there are various initiatives and forces on the demand side that should stimulate the market of transport services. The increasing demand for more sustainable freight transports among transport-buying companies, in Sweden but also in other European countries, is a reality for many logistics service providers today.

The **purpose of this paper** is to identify the challenges facing the transport providers based on changes in the demand concerning environmental aspects, but also the opportunities for these transport providers that are proactive. It also provides an over-view of existing literature

and studies in the fields of logistics and transportation with regards to environmental aspects. The policy area is not in focus in this paper, rather a market-driven view of how the market forces can be used in attaining a more sustainable freight transport sector.

The **method** applied in this paper is a combination of qualitative and quantitative methods. A selection of data from a PhD-thesis (Lammgård 2007) is presented to illustrate the market of freight transports, whose results were based on an interview study in two industrial dyads but mainly a large survey among logistics managers in transport buying companies. This survey was conducted in 2003 where 567 responses (response rate 49%) were analyzed and the strata were arrived at in a double sampling process (Lammgård, Saxin et al. 2004). The experience of research within the area of environmental considerations in transport buying since 2001 will be used in analysis.

2. Literature overview

2.1. The development of environmental management in companies

Corporate environmentalism has emerged and has been redefined through successive stages with differences in the external pressures driving corporate activities, internal structures and how corporations responded. Hoffman (2000) divided this evolution in four periods: industrial environmentalism (1960-1970), regulatory environmentalism (1971-1981), environmentalism as social responsibility (1982-88) and strategic environmentalism (1989-1999). In the first period, authorities played an active role but over time, industry has taken a more proactive stance. Roy and Vézina (2001) claimed that environmental management had gone from an add-on function to being an integral part of business operations, since it is often viewed as vital for a corporate mission. In the mid-90s, companies realized the strategic advantage of, on one hand, satisfying environmental conscious customers along with increasing demands for environmental technology, and, on the other hand, ensuring that business activities get adapted to environmental concerns (Dobers and Wolff 1995).

Theory building concerning environmental aspects of business has evolved. Wolff (1998) questioned if e.g. green marketing or green strategy development is different from the established theories, maybe in its complexity (since environmental problems cannot be solved by individual actors; they are cross-disciplinary by nature and extremely emotive), but it is from a management perspective structurally similar to other complex problems. Lippman (1999) identified four characteristics of effective supply chain environmental management (1) Top-level leadership, (2) cross-functional integration, (3) effective communication within companies and with suppliers, (4) effective processes for targeting, evaluating, selecting and working with suppliers. Such management can result in a competitive advantage.

Corporate environmentalism emerges is often formulated into an *environmental strategy* which is a part of the strategic management. The first step in the implementation of a system of environmental management is the development of a *Corporate Environmental Policy (CEP)*. The key inputs to this policy are the findings of the initial environmental review, the outcomes for environmental management, external expectation of the business (e.g. triple bottom line, sustainability) and overall business objectives (Sullivan 2001). In a study of 187 large European companies (Hibbitt and Kamp-Roelands 2002), almost all (91%) the companies had implemented a CEP and the leading companies were found in Norway and Sweden. When implementing an environmental strategy, a company must decide upon an appropriate way to signal a superior environmental performance to stakeholders by using e.g. Corporate Environmental Reports, Environmental Management Systems, and Eco-labeling programs.

A *Corporate Environmental Report (CER)* vary in content and an important challenge is to find standards that assure the reliability of reported data (KPMG/Wimm 1999). Corporations provide stakeholder groups with little information about their efforts to improve future environmental performance, but the ISO compliant companies use more target measures than non-compliant companies (Marshall and Brown 2003). It is more and more common with sustainability reporting, a CSR report, where integrated Triple Bottom Line reporting involves one single performance measurement (KPMG/Wimm 1999) and the guidelines of Global Reporting Initiative¹ (GRI 2004) are frequently used.

An *Environmental Management System (EMS)* provides standards prepared by regional, national, and international standard bodies, containing demands (e.g. on environmental policies and goals, environmental strategies, plans of revisions), where all activities aim at constant improvement (Starkey 1999). An EMS is not only a rational management tool for action, but also for communicative action and organizational learning (Burström von Malmberg 2002). A review of studies carried out by Morrow and Rondinelli (2002) focusing on motivations of companies adopting EMS, showed that large multinational companies wanted to extend EMS to suppliers. Companies in the international markets, especially in the US and Europe, often considered EMS to be a way of developing competitive advantage. In the case of the transportation chain, the actors are also affected by an EMS if e.g. a company assesses and communicates environmental demands to transport providers.

¹ Homepage GRI: www.globalreporting.org/.

Eco-labeling shows that an independent body of certification has approved the product. The driving forces have been growing consumer concern about the environmental impact of products and services, along with increased misleading claims from producers (Roy and Vézina 2001). In Sweden, there are criteria for passenger and freight transport, where the requirements placed are e.g. on the use of non-renewable energy, manufacturing of energy driving the vehicles, and correct disposal of vehicles materials when scrapped (SNF 2007).

Logistics managers who take environmental aspects into consideration are confronted with calculations of the environmental load of transports, often included in a **Life Cycle Assessment** (LCA). This tool sheds light on a product's environmental impact at every stage from extraction to disposal; a cradle-to-grave approach (Welford 1999). It is complicated by a lack of standard values in the calculations, which produces variations in the outcomes.

Research in the US in the mid-90s by Murphy et al. (1995) showed that concern about environmental issues was greater for larger firms and for manufacturing firms, and further that logistics plays a more prominent role in the implementation rather than in the formulation of environmental policy.

2.2. Business logistics and the environment

The environment can be viewed from three perspectives: the resource, the society and the company perspective (Dobers and Wolff 1995). In the third perspective, the changed competitive situation along with increased demands for measures for environmental protection, force the company to take an active stand. This can be turned into a strategic advantage; on one hand satisfying environmentally conscious customers and increasing demand for environmental technology, and on the other hand ensuring that businesses adapt to environmental considerations. These perspectives can be applied on freight transports. From a resource perspective, the transport sector uses oil as the main source of fuel, which produces CO₂ emissions which contributes to the greenhouse effect. This increases problems from society's perspective and legislation is a possible tool, but companies can also work proactively, since legislation may reduce their degrees of freedom. This is done today in the transport sector but the question is at what speed measures are implemented.

Three ways of diminishing the environmental impact of the transports are (Pilo 1997; Björklund 2005):

- Diminishing the need for transports.
- Increasing use of environmentally better modes of transport, e.g. from truck to electrified railway.

- Minimizing the environmental impact of every mode of transport, e.g. better fuels, technology, maintenance, knowledge, speed limits, and vehicle design.

Diminishing the need for transports includes organizational and logistics changes such as increasing the load factor of existing modes of transports used by e.g. coordinate transport flows. Naturally, it also involves the long-term perspective, including structural changes e.g. localization of industries which is not dealt with in this article. There is, of course, also the possibility of combining these methods.

Carbon abatement measures targeted on modal choice, vehicle fill and fuel efficiency are likely to prove more effective than policy measures (e.g. economic measures) to contain the growth of CO₂ emissions from freight transport (McKinnon 2008). This is mainly because companies are realizing that cutting the carbon footprint of freight operations usually saves money and improves competitiveness.

In business relations, the selling company usually purchases the transport to the customer and this task is executed by the logistics manager or equivalent. Wu and Dunn (1995) showed in a model based on the value chain by Porter (1985), how logistics decisions interact with other business functions and concluded that logistics managers play a critical role in a company's environmental management program because their decisions have a direct impact on the environment e.g. choice of transport mode.

Logistics managers in transport buying companies evaluate different aspects when transports are bought. It is not only a transport service to be sold but a function, where the core service is to transport freight from point A to point B in the right time. However, there are other service quality aspects of interest, and among these can the environmental aspects of the transports be positioned. The buying of logistical services is dealt with in classic logistics literature (Christopher 1992; Bowersox and Closs 1996; Coyle, Bardi et al. 2000; Bloomberg, LeMay et al. 2002) but do not normally include the environmental considerations. If environmental aspects are mentioned, it is in the context of reverse logistics, life-cycle assessments, or safety. In reality, environmental concerns are taken into account when freight transports are purchased to a various extent, at least in Sweden which has been shown in various studies (Laitila and Westin 2001; Björklund 2002; Björklund 2005). Therefore, the role of buyers at the transport market is vital.

3. Analysis of actors on the freight transport market

3.1. Sources of influence in the choice of transport solutions

The main actors involved in the transport chain are normally the seller of goods (shipper) and the freight transport provider (forwarder) who forwards the goods to the buyer (receiver). The choice of transportation mode is made in a complicated behavioral system where certain actors might have an interest in influencing the choice in an environmentally better direction and even be willing to pay for this added value. Their problem might be that they do not know how the product will be transported, the environmental qualities of the transport mode, how efficient influence can be accomplished or what alternative transports are available. In most cases the direct decision when selecting transportation mode is made by the transport buyer, the shipper, or its forwarding agent but the process that leads to the decision is more likely to be more complicated than that. The transport takes place as a stage in a value-added process where the goods receiver, its distributors/customers and the final consumer all have opportunities, and even motives, to exert influence on the choice of transportation mode. If a company's customers of goods put demands on how the goods are transported, this information is probably received by the marketing and sales function and/or the logistics function. Figure 3.1 proposes a model representing the influence processes in the choice of transport solutions.

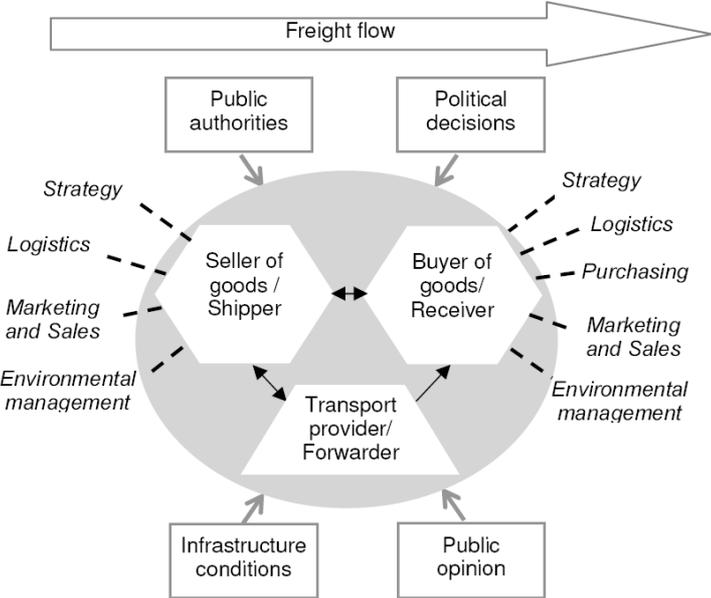


Figure 3.1 An overview of the sources of influence in the choice of transport solutions

Firstly, there are influences within each company from different functional areas. In the selling company it could be from e.g. environmental management, logistics, marketing and sales and strategy. Influences within the buying company can be from areas e.g.

environmental management, logistics, purchasing, strategy and customers. There are also influences between the actors in the transport chain, the grey area in Figure 3.1. *Secondly*, there are also sources of influence about how the transports are performed from an environmental point-of-view, originating from outside the organizations directly involved in the transport chain. Public opinion is an important factor especially as transports and environmental effects affect the public directly. The political decisions e.g. taxes on diesel are also of influence. This also applies to Public Authorities, e.g. The National Road Administration, regarding the condition and the location of the infrastructure. These actors constitute the freight transport market and influence the use of environmental measures.

3.2. Environmental considerations in freight transports at the shippers

A key issue is to understand how the transport buyers make buying decisions and the impact of environmental considerations. The proposed model in Figure 3.2 is based on a qualitative interview study of two industrial dyads (i.e. four companies) in Sweden. However this model is judged to be representative for, and generalized to, a typical freight transporting company.

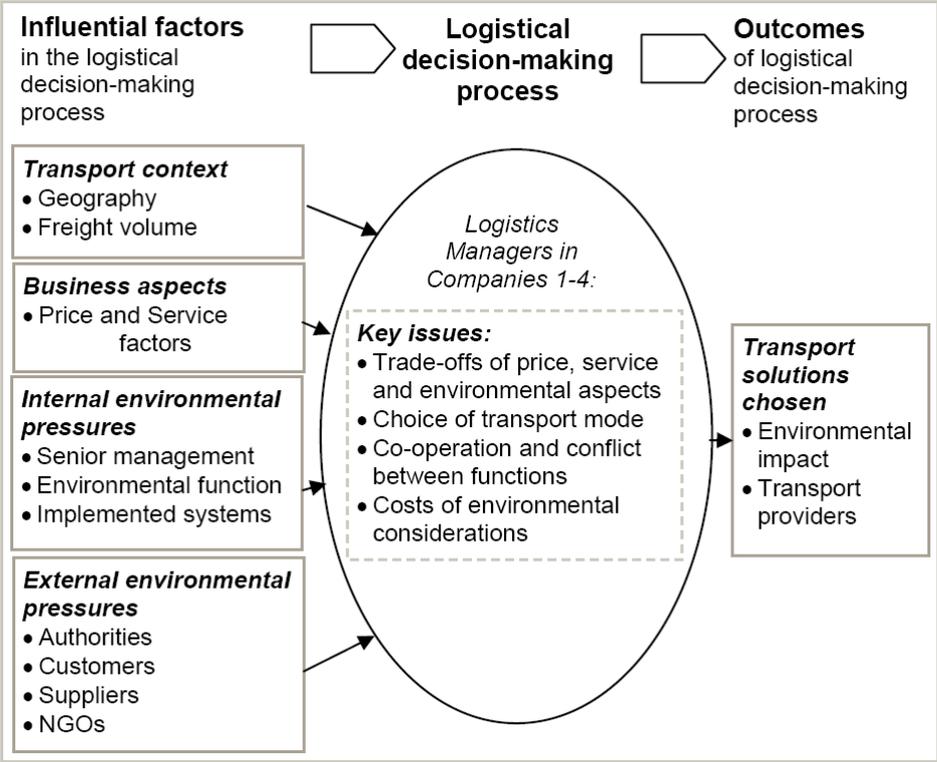


Figure 3.2 Proposed model of environmental considerations in the logistical decision-making process

The identified influential factors in the process of purchasing freight transports are in short: the transport context, the business aspect, but also pressures for environmental improvements

internally but also externally from the outside of the own company. The results show that the companies are well aware of the environmental problems of freight transports and some of them try to work proactively in order to keep ahead of legislation, especially the larger ones in the study. Historically, the authorities have been a strong driving force for the environmental work in the production companies, but one company claim that it had become a competitive advantage. One Environmental Manager described the evolution of corporate environmentalism from the 1970's with the regulatory authorities setting the agenda, for "greener" products and environmental management. This description coincides with the stages identified by Hoffman (2000) described before. In this view, the first stage focused on specific issues of visible forms of pollution (such as DDT), but corporate environmentalism developed over time and in the last phase, industry took a more proactive stance.

Results for reducing environmental effects can be more efficient if environmental management is integrated in the whole supply chain and not only in an individual company. In this study, one useful practice directly linked to this is the evaluation of transport suppliers' environmental performance. This creates an opportunity if the companies in each business relation decide to further integrate the collaboration on environmental matters as far as transports are concerned. Certifications in the environmental area, EMS and/or eco-labeling schemes, were recognized as a way of giving credibility to companies when they for example put demands on suppliers.

The Logistics Managers (LMs) interviewed had key roles as decision-makers of transport solutions and exerted an influence on environmental effects of the transports performed, which is in accordance with results of Wu and Dunn (1995) who concluded that the LMs' decisions have a direct impact on the environment. The process of taking environmental considerations into account when choosing transport solutions is complex, as seen in Figure 3.2. Companies asked for environmental information from their transport suppliers, but had not yet worked out routines or decided clearly what weight the environmental considerations should have in the purchasing process. It was also the LM that confronted the *trade-offs between price, service qualities and environmental aspects* of the transport solutions, which resulted in a final decision of which alternatives to choose based on mainly qualitative judgments of the LM. The *choice of transport mode* is included as an important parameter in this process.

Although the companies studied had persons in the environmental function, an EM did not believe that environmental considerations were an integrated part of business at that point, as claimed in theory by Roy and Vézina (2001). The work with environmental considerations was sometimes done in *co-operation* with persons at the environmental function, but there are

sometimes *conflicts between functions* and there were discussions about *costs of environmental considerations* and what would be acceptable. If the conflicts prevailed, the senior management had to make decisions and in that way policies were set for future work.

Making environmental improvements may entail an initial investment in time and money, but it will pay off later. However, it is probably more common that an additional amount of work is required, and/or that additional costs are induced. These costs can occur within a company (e.g. one company had accepted a higher cost for using trains), or between companies in the supply chain (e.g. a transport provider that charged a fee for answering environmental evaluation forms from smaller customers). If environmental considerations are going to be an integrated part of the business processes and shared among functions in a company or between partners in a supply chain, then these costs must inevitably be on the agenda in the budget or negotiation discussions, along with e.g. quantities and prices of products.

The outcome of the process is the environmental impact from a company's transports and the choice of transport provider, as seen in the Figure 3.2. At the same time, environmental considerations are taken into account when transports are bought to a greater extent. A viable way for the transport providers is to examine for what transport buyers the environmental aspects of how the products are transported are viewed as an added value.

3.2.1. Examples of initiatives among shippers

There have been collaborations among shippers in order to improve the evaluation of transport providers' environmental performance in order to exert pressure on transport providers to reduce the environmental impact from transports. Here are some examples: three from Sweden and one from Great Britain.

Systole - a tool for sustainable transport

The Forum for Sustainable Transport is collaboration between six major Swedish buyers of transport² and the Swedish Road Administration. The cooperation has resulted in Systole, a tool to procure more sustainable transport as it handles environmental and safety requirements in procurement negotiations. It is also a meeting-place for sellers and buyers. Transport sellers have an opportunity to display their sustainability work. The aim is to spread this tool to all who procure and sell transportation.

² Perstorp AB, Preem AB, Stena Recycling AB, Strålfors AB, Södra and Trelleborg Industri AB. See homepage: <http://www.transportupphandling.se/Magellan/render/>

The requirements in Systole are based on the Forum for Sustainable Transport's vision of a sustainable transport: "Our road transport is conducted in a safe, environmentally and efficiently and never give rise to injury. Our proactive work speeds up progress in the transport sector." Systole is built up of goal-oriented requirements in seven levels. There will be a number of benefits to create a long-term approach in striving to attain the goals defined and give the transporter long term aims. The buyer can reflect on what he/she can contribute in order to enable effectiveness. Companies can purchase a license to use Systole.

Clean shipping criteria

It is not only road transports that are of interest. The shipping industry has traditionally not been proactive in taking environmental measures but it has started to change. The transport buyers want to judge the environmental performance of shipping companies more and more. Therefore, the Clean Shipping Project³ launched in 2008 an index for comparison of environmental performance in shipping with the cooperation with the world's largest shipping operators. Twelve of Sweden's biggest importers and exporters have signed a letter of intent to place demands on their shipping suppliers and to use the environmental demands described by the project as part of their procurement criteria. In 2008, these companies asked 77 of the world's largest shipping operators to report environmental information through the Clean shipping index. The index addresses 20 factors that can affect the environment including marine fuel, lubricants, bilge water, ballast water, antifouling paint, refrigerants and waste. After the data for a shipping line with vessels have been filled in, it receives a total score in percentage on a scale measuring how "green" the supplier is but also a score by vessel and a score by segment (including the segments Chemicals, NOx, CO₂, SOx and PM, and finally Water, fuel and waste control).

A high ranking represents a competitive advantage and environmental gains both for the shipping operator and its customers, which is a driving force that has been lacking previously in the shipping industry. The project believe that Swedish operators are likely to be highly ranked by the index since the Swedish shipping industry are among the leaders when it comes to implementation of environmental measures. The Index is freely available for anyone to use and non-Swedish companies are also welcome to participate in the network. At present, the project leaders are looking into the possibilities to get accreditation for the system (as they are self-reported today and not controlled). This will guarantee that the reported values are judged in a neutral way and until then, the scores of companies are not publicized officially. The interest of the index has been high also from other countries than Sweden.

³ This project is driven by public authorities in Western Sweden and is also financed by the EU Structural Fund "Objective 2". This goal of this non-profit project is cleaner shipping and sustainable growth.
<http://www.cleanshippingproject.se>

Network for Transport and Environment (NTM)

This Swedish non-governmental organization NTM⁴ brings together companies, researchers and other organizations interested in transports and environmental issues. It was initiated in 1993 and aiming at establishing a common base of values on how to calculate the environmental performance for various modes of transport. In order to promote and develop the environmental work in the transport sector, NTM acts for a common and accepted method for calculation of emissions, use of natural resources and other external effects from goods and passenger transport. The method is primarily developed for buyers and sellers of transport services, hence enabling evaluation of the environmental impact from their own transports. The organization has for example developed an on-line tool to facilitate calculations for transport buyers and a questionnaire for transport supplier evaluation. In Sweden, the NTM data is often considered to be the most objective and therefore frequently used by companies.

Freight Best Practice

Freight Best Practice⁵ was funded by the Department for Transport (DfT) in the UK and managed by AECOM to promote operational efficiency within freight operations. It offers free information for the freight industry covering topics such as saving fuel, developing skills, equipment and systems, operational efficiency and performance management. A new program is the On Line Benchmarking (OLB) that will help the freight industry improve performance and is launched in July 2009. It will be possible to make external anonymous comparisons, do secure data transfer to meet with current Government standards, and instant results reported to users from data entered into the system. The gain is to be able to monitoring CO₂ Emissions from Road Freight Operations by using a free CO₂ Emissions Inventory Tool.

3.3. Environmental considerations in freight transports at the transport forwarder

The transport forwarders are dependent on how their customers value environmental aspects, which varies among transport buyers. This was shown in the results of a large survey including the answers from 567 transport buying company units in Sweden (manufacturing and wholesale companies) which formed the base of a PhD-thesis (Lammgård 2007). Some conclusions about the transport buyers in Sweden were drawn that the transport providers have to relate to.

⁴ See website: www.ntm.a.se

⁵ See website: <http://www.freightbestpractice.org.uk/performance-management>

Environmental practices

A great dividend was between manufacturing and wholesale companies, where it was much more frequent in manufacturing companies having a Corporate Environmental Policy and an Environmental Management System, especially among the medium and large ones. About a quarter of companies had implemented an EMS, and about the same share was in the process of doing so. Companies with more than 100 employees had either implemented or were in the process of implementing an EMS to the highest extent (77-91%). ISO 14001 was the EMS most commonly chosen (92%), whereas EMAS had a very small share (6%). It can be concluded that EMS was more common in larger companies, probably because they have dedicated environmental departments and more resources put into environmental work.

Valuation of environmental aspects

The larger companies (more than 100 employees) rated environmental considerations considerable higher than smaller companies. These companies were responsible for about 3/4 of the freight sent in ton equivalents (72%) among companies having freight transports exceeding 150 kms. Manufacturing companies rated environmental considerations much higher than wholesale companies. Prior research is in line with the survey results regarding concern about environmental issues is greater for larger firms as well as for manufacturing firms (Murphy, Poist et al. 1995).

Size of company had a greater impact on the willingness-to-pay for environmental concern than trade of business⁶ among the manufacturing companies. Among the medium and large manufacturing companies, the differences were small between those with an EMS and those without one. However, the companies with less than 100 employees are more price-sensitive, but those with an EMS show a much greater willingness to pay⁷ was 2-3 times higher in comparison to those without an EMS. An implemented EMS is therefore an indication on a higher receptiveness for environmental arguments among companies with less than 100 employees, if these companies are to be included in a marketing program.

Influence processes

The pressures from within the company and from the customers regarding environmental

⁶ Manufacturing companies were broken down in five generic groups: Foods/beverages /tobacco, Woods/pulp/paper, Chemicals/Printing/Publishing, Metal/machinery/equipment and other manufacturing.

⁷ The willingness-to-pay ratio was the quota between the points attributed to environmental efficiency divided with the points attributed to price (the respondents distributed 100% depending of importance when transports were bought between: Price, transport time, environmental efficiency and on-time delivery).

demands that affect the modal choice were explored. The large companies received pressures from both customers and from within the company to the highest extent (about 25%). It was especially the large manufacturing companies that received pressures from within the company (about 65%), even when there were no pressure from customers. However, the wholesale companies had more pressure from consumers than the manufacturing companies.

The marketing context

The results were put together in a conceptual model for the marketing of environmental advantages in freight transportation. It can be used as a tool in analyzing how to create customer value for freight transport buyers by taking their *need for transports* and their *environmental management* commitment into consideration along with the *economic constraints* and integrate it in the *Marketing context* of transport sellers. All this is possible by scrutinizing the shippers' transport service requirements. This process is seen in Figure 3.3. However, the role of price is an important component. It originates from the transport sellers' *Service production context* that must be considered in relation to the customer value. In the end, it is ultimately the shippers' choice.

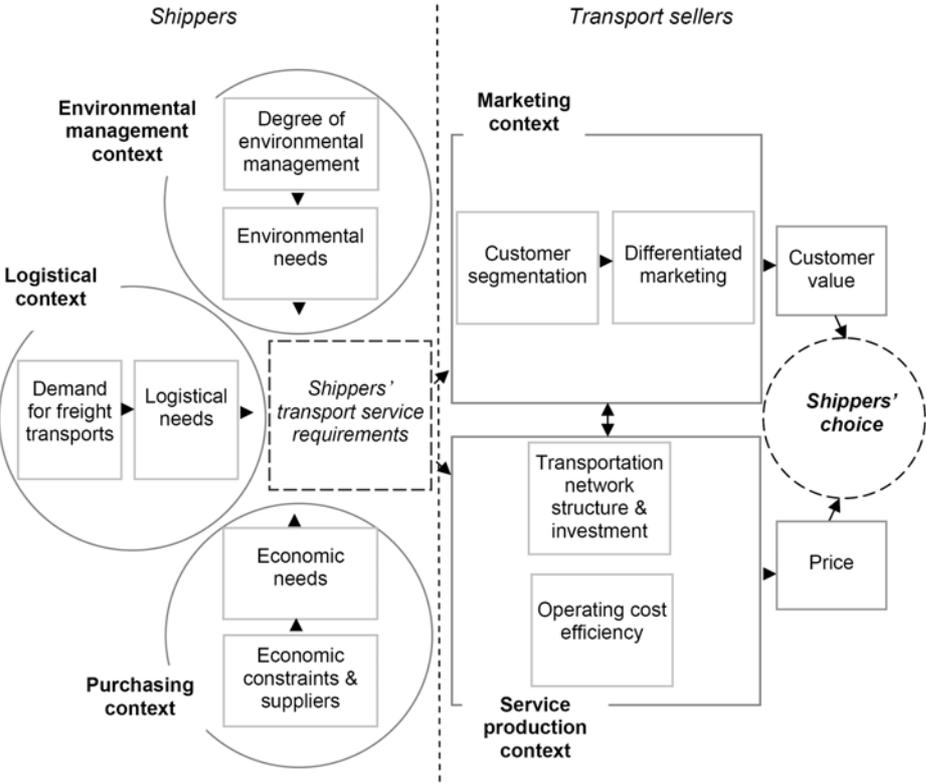


Figure 3.3 The use of theory in marketing, logistics, purchasing and environmental management for the marketing of environmental advantages in freight transportation

A customer segmentation of shippers can then made by classifying them based on their environmental needs, their priority of price (e.g. importance of price/willingness-to-pay for

environmentally better transports) and their transport needs (e.g. goods volumes sent per year). All these needs and preferences can be weighted together in a resulting total marketing priority matrix for marketing efforts of environmentally better transports.

3.3.1. Examples of initiatives among transport forwarders

The three major players in Sweden (and worldwide) in volumes less than a truckload (LTL) are DHL, DSV and Schenker (although they are also large on truckload shipments). Therefore it is interesting to see how these three have dealt with the development of an increased interest in transport services that are better from an environmental point of view.

DHL

Through its GOGREEN service DHL Express⁸ offers carbon-neutral shipping to its customers. Using two custom built tools – a Carbon Calculation system and a Carbon Management system, DHL can assess the carbon emissions created by a customer's shipment, identify the most appropriate abatement projects, coordinate the offsetting of emissions, and then, in conjunction with an independent third party, issue certificates that detail the annual carbon offset data for that customer. Customers can use these certificates to prove their contribution to countering the effects of climate change. This service has a higher price than a regular one.

The Swedish DHL (owned by Deutsche Post DHL) also announced in December 2008 that it buys green electricity equivalent to 50 GWh, which cover half of their need for electricity in Sweden and reduces their CO₂ emissions with 7900 tons during the third quarter 2008 and all of 2009. DHL overall goal is to reduce the CO₂ emissions with 30% up to year 2020. DHL claim to focus on five areas: optimizing their vehicle fleet (replacement of vehicles on fossil fuels to others on alternative fuels), energy efficiency (especially in their buildings), innovative technique (through an innovation center with focus on logistical trends), changed behavior (internal environmental education) and shared responsibility (make their suppliers to reduce their CO₂ emissions).

DHL say they are the first global logistics company to join the Climate Neutral NET. This network was established to assist those interested in achieving significant reductions in greenhouse gas emissions to reach their goals, by making public the inspiring plans and strategies that pioneering partners have drawn up in order to achieve climate neutrality and encouraging them to publicize their achievements via regular up-dates of the web pages.

⁸ See www.dhl.se

DSV

DSV Road⁹ introduced an environmentally better product DSV ECO this year. The profile it as the only transport provider that has a lower price on an environmentally better product. All deliveries that are transported with this service obtain a discount. In return, the customer accepts a flexible loading day which enables DSV to plan the transport so the vehicles are used to a maximum and driving the shortest possible kilometers.

Schenker

In Sweden Schenker AB¹⁰ is a wholly owned subsidiary of Schenker AG, which is a subsidiary of Deutsche Bahn. The implementation of an Environmental Management System, ISO 14401 was finalized this year. Their CSR report follows the principles and standards produced by the organization Global Reporting Initiative (GRI).

In 2006, Schenker in Sweden took the initiative in expanding collaboration between various agencies in the transport sector. Representatives from truck manufacturers, fuel producers, infrastructure bodies and the research community were invited to take part and the group comprises of e.g. Volvo Trucks, Preem Petroleum AB, the Swedish National Road Administration, the Centre for Environment and Sustainability, GMV, and Schenker AB. To lay a scientific foundation for collaboration, a study was carried out at the Department of Physical Resource Theory, Chalmers University of Technology which in turn formed the basis for the group's publication, "On the Road to Climate Neutral Freight Transportation"¹¹. The group's common vision and individual undertakings to improve the efficiency of freight transport by road, and in doing so achieve the target of halving the climate impact by 2020, was presented in October 2007.

Schenker AB has a program focusing on seven strategies: changed driver performance (eco-driving, lower speeds), new vehicles, better fuels, combination of transport modes (intermodality where 10% of their transports will be by combined transports), increased load factors/shorter driving kilometers, smarter city logistics and optimized vehicles combinations. The plan is to launch a demonstration project in Gothenburg for smarter city logistics.

⁹ See www.dsv.se

¹⁰ See www.schenker.se

¹¹ See the joint website, administered by the National Road Administration, www.vv.se/klimatneutral

4. The identification of key challenges for the transport industry

Radical changes are needed in order to cut the emissions of carbon dioxide. There are a few key challenges in relation to this that are presented here.

4.1.1. Reducing the need for transport

The most obvious solution would be to reduce the number of shipments and the distance transported, which is concluded in the measurement ton kilometers. The development in for example Europe shows the opposite. This is dependent of a long-term planning for examples the localization of distributions nets for transport buyers but also transport providers. The e-commerce is an important factor to take into account.

4.1.2. Use the infrastructure more efficiently

The infrastructure investments, especially in rail, have long planning periods and the infrastructure therefore is a fixed factor in the short run. In most cases, rail can be considered a better alternative from an environmental point-of-view than truck for freight transports, even if the production of energy is taken into account. A share of 95% of the total transport work on rail in Sweden use electricity and the rest diesel (NTM 2005). The company Green Cargo, which was formed from the old monopoly company on rail (SJ), is one of the largest freight forwarders on rail in Sweden and uses eco-labeled electricity “Good Environmental Choice”¹². The modal shift from road to rail is slow in the EU. A combination of transport modes is necessary. Intermodal road-rail transports are an alternative to direct door-to-door rail transports, if the company does not have own railway sidings. This is justified both economically and environmentally on longer distances, at least at distances longer than approximately 450 kilometers but often also at distances down to 250 kilometers.

The large transport providers (e.g. Schenker or DHL) have their own transport networks. This restricts smaller transport buyers (with less than a truckload) to influence on where the goods is transported. On the other hand, this facilitates the plans of these transport providers to increase their load factors. The investments in facilities are though fixed costs and not easily changed due to environmental reasons for moving for example a distribution center.

Within the networks, the effectiveness and planning of routes is facilitated by Intelligent Transport Systems (ITS) measures. This could be used to measure and reduce the CO₂

¹² In Sweden, the organisation SSNC delivers an independent labelling scheme. See www.snf.se. It places requirements on e.g. the use of non-renewable energy, manufacturing and distribution of energy driving a vehicle, correct disposal when a vehicle is scrapped.

emissions although it is not widely implemented. However, the standardization work and use of through Europe has a long way to go and also the development of data output from the infrastructure holders. The question is at what speed ITS can be implanted and be a tool for the abatement of CO₂ in the near future.

4.1.3. Use resources more efficiently

It is recognized among all actors, especially the large transport providers, that using resources more effectively means also reduction of costs.

This involves the vehicles where increasing the load factor is a key for less driven ton kilometers. Alternative fuels is another area under debate but new vehicles entail high investments and the uncertainty of the future path of these vehicles slow the speed of this measure. Another measure is eco-driving, which is a fairly risk-free, minor investment that pay-off shortly after educating the drivers. Up to about a 30% reduction in fuel for a truck can be saved with this measure.

Although the facilities and distribution centers are fixed costs in the short run, there are things that can be done e.g. the co-ordination of logistical activities and economies of scale through for example Regional Logistics Centers. In this way, the different actors with a common interest (to make the regional transport more efficient and competitive) can act jointly and come together. At best, such an initiative could lead to deeper co-operation and in the long run co-ordinated deliveries across actors. This can facilitate the measures for the reduction of CO₂ of a company.

4.1.4. The problem of city-distribution

Increased urbanization is one of the major trends in the world today. The distribution of goods in the cities today is problematic, where not only the emission of CO₂ is serious but also other environmental effects such as noise, emissions of particles and NOX. Congestion is also an environmental problem but brings other costs to society such as loss of productivity (as the citizens are spending time in queuing instead of being productive at their work). Growing urbanization accelerates this development in the city centers as more volumes of goods are transported there.

A main problem is the load factor. The city-distribution of one transport provider does not always manage to fill up their vehicles and only major transport providers manage to get a relatively high load factor. However, it should be notated that there exist a measurement

problem as it is many times a distribution loop where the load factor is high in the beginning and naturally low in the end. This is often a lack of data regarding load factor in general and even more in city distribution. Therefore, the demands of planning the distribution loops among customers are high in order to reduce the environmental performance. In addition, the goods receivers often have demands on time of delivery for example when the goods only can be received before the shops open. This means even higher pressure on good planning.

At the same time, the local authorities aim for reduced traffic in the city centers in order to make them more attractive, not only from an environmental and economic perspective but also from a social point of view (creating meeting places for citizens). One quite common reason behind all these measure is often to protect an old historical city centre (e.g. Riga). One example is actions taken within the EU-project START¹³.

There are various examples where new physical barriers “rising bollards” in cities in Europe or traffic regulation (e.g. no distribution between 11 am to 7 pm in certain streets of Gothenburg, Sweden) have been implemented and thus created time-windows for goods distribution. Also, there have been various projects for consolidation schemes. However, this demands cooperation between competing transport providers (which is not always is possible due to the rules of competition) or co-deliveries between goods senders (which they do not always want as However, these are yet on the project level are to be up scaled.

All these developments regarding in city distribution demands change. This reduces the degrees of freedom for goods distribution which means that the transport providers cannot continue “business as usual”. Also, the goods receivers have to take responsibility and understand that their demands have to change. Therefore, the establishment of freight transport networks within START is a good example of how these actors can meet and discuss their common interest: to make the goods distribution as efficient as possible in the shortest possible time.

4.1.5. Inter-organisational cooperation

The demand on inter-organisational cooperation in environmental issues between transport providers is probably going be harder in the future. Two examples where this is needed were mentioned above, Regional Logistics Centers and the city distribution problem. This requires trust and often a willingness to share information. This means a reduction of control as the distribution is not only done within the own organization and distribution networks. This is a hard nut to crack for the transport industry.

¹³ START=Short Term Actions to Reorganize Transport of goods, www.start-project.org, involving Bristol, Gothenburg, Ljubljana, Ravenna and Riga.

4.1.6. Standardization for measuring environmental performance

The large transport providers and large transport buying companies (especially the manufacturing companies) have worked with the environmental issues of freight transportation for quite some years now. Two examples shown from Sweden are the non-governmental organization NTM and the newer Clean Shipping Index. However, both these initiatives that provide tools for measuring environmental performance would benefit from standardization in the form of certification and this is now acknowledged by them. The work of standardization of method for calculations of environmental loads from transports is not only an issue in Sweden (through NTM) but also in Europe.

The power of certification is illustrated by the widespread use of the Environmental Management System ISO 14001. The results presented showed that this has helped the transport buyers of transport to put demands on transport providers. This is true especially for smaller companies that do not have the resources for more refined methods in judging the transport providers environmental performance. This way of signaling environmental value should not be underestimated.

4.1.7. Development of value-added services

The research presented on the demand for environmentally better transport services showed that segmentation of transport buying companies is possible (Lammgård 2007). The importance of the environmental aspects has grown in the transport providers yearly customer surveys during the last years. The transport providers are in a situation where certain groups of customers (Lammgard, 2007) have a shift in their demand, but at the same time there is an uncertainty among the transport providers of this should affect their products and services sold as the willingness to pay of the customers are highly uncertain.

This means that environmental performance of a transport is an added-value service to some segments of buyers, especially large manufacturing companies. This brings implications the marketing management. The largest transport providers have understood this and have started to offer services with environmentally better performance.

If segments of transport customers are interested and, at best, willing to pay for environmentally better transports, then this a major challenge for the transport providers. Future possible policy interventions in the transport sector are dependent on how well the market can tackle the abatement of carbon dioxide. Therefore, it is of major interest of how successful this market mechanism, including interaction between the transport buyers and sellers on the market, will be.

5. Discussion

The planet is experiencing a time of population and economic growth while at the same time, it is limited in its ability to supply resources and to absorb the wastes (Stead and Stead 1996). The environmental problems are air and water pollution, climate change, waste-disposal problems, acid rain, and species loss. Changes are needed in many ways, but the major one might be the economic paradigm, and the important role of business leaders cannot be underestimated since they represent the largest group of economic decision-makers (Stead and Stead 1996). Other pressure groups are politicians in the European Union and Sweden, environmental organizations, freight forwarders and shippers. Their influence may lead to political decisions that will affect companies having freight transports, but also attitudes among the interested parties in the company's environment.

According to stakeholder theory (Freeman 1984), stakeholders are present both internally and externally of a company. Companies that have the capability to focus on a more efficient integration, both internally and externally, will probably be more successful than those who only concentrate on internal development (Normann and Ramírez 1994). This means that the transport providers that work long-term and seriously with the environmental issues will be rewarded, and as in many strategic issues, the proactive ones and first-movers probably reap the larger benefits. Some companies are proactive and some are reactive to legislation. It is not likely that all will act in a proactive way and therefore, it may be necessary with regulations unless the industry can show improvements regarding CO₂ emissions.

A common misunderstanding is that the transport industry fears any stricter environmental regulations but that is not the whole truth. Many times, the players at the market working with environmental improvements many times are not opposing these suggestions as long as these regulations are valid for all actors on the market. The competition in freight transports among transport providers in Sweden includes transport companies from all of Europe more or less where competition, especially from the "new" members of the EU, is keen. The key is to keep a healthy competition so the same rules apply to all and equally important is the control of the observance of them. This is vital for convincing the transport providers to make investments for improving the environmental performance. Therefore this demands a dialogue between the industry and the representatives of society. The European Union plays a major role in this development for Sweden.

There is no doubt about that the freight transport industry faces major challenges in the near

future, especially in connection to the emissions of carbon dioxide. This article is based on research conducted on the freight transport market in Sweden, but the problems are similar to all countries. In Sweden, the share of the CO₂ emissions originating from transport is accounted for 30 %. However, a large share come from private cars but the worrying part is the growth rate of freight transports especially on road in Europe is growing faster than GDP. The question is if the market mechanisms in this paper can be developed to be effective soon enough in relation to the immediate need of reduction of CO₂. If not the transport industry probably will face policy interventions.

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