



Sustainable Logistics Services Buying

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Stuttgart

2012

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Summary

This paper strives to answer the general question, how far purchasers of logistics services take into account aspects of sustainable development. On the example of the German Sustainable Development Strategy, which is based on the EU Sustainable Development plan, five fields of activity are defined in the literature part of the paper – the reduction of transport intensity and emission, the reduction of land use, the choice of carrier under considerations of sustainable aspects, the permanent improvement of working conditions, and the enhancement of qualified employment. Within these fields propositions for purchasing companies of logistics services are developed, which contribute to safeguard ecological as well as social sustainability. To illustrate the extent sustainable aspects are taken into account in the purchase of logistics services a questionnaire was sent to 750 purchase and logistics managers. In practice purchasing companies value ecological and social aspects high importance but consider criteria of sustainable development in the selection process of logistics service providers to a smaller extent. Furthermore, purchasing companies influence logistics service providers to a minor extent regarding ecologically and socially sustainable actions. A fundamental precondition for a sustainably oriented procurement of logistics services can be seen in the purchasing companies' awareness of the need for integrating sustainable aspects in economic decisions.

Keywords

Service buying, Logistics Services, Service Buying, Sustainability

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1 Purpose

Companies located in developed countries can resort to a diversified market of logistics services. Consequently the procurement of logistics services plays an important role. Above all, it comprises the assessment of logistics service providers' capabilities and previous operations. Among the typical approaches of managing buyer-supplier-relationships the literature increasingly discusses approaches considering the integration of sustainable aspects in buyer-supplier-relationships (Seuring and Müller, 2008a). The concept of sustainable development raises the question, how to safeguard forceful growth and social as well as economic sustainability at the same time (United Nations, 1987). Recognizing this, the paper strives to answer the general question, how far purchasers of logistics services take into account aspects of sustainable development.

For this purpose a literature review is conducted in the following section, analyzing relevant research on the concept of sustainability and the awareness of sustainable issues in logistics service buying. In the third chapter of the paper five fields of activity are deduced from the German Sustainable Development Strategy (Federal Government of Germany, 2002), which is based on the European Union (EU) Sustainable Development Plan (Commission of the European Communities, 2001a). To evaluate the general role of sustainability in the purchase of logistics services and especially the contribution of logistics service buying to these five fields of activity an explorative survey was conducted. The fifth chapter describes and discusses the empirical results of this survey. The conclusion section points out the paper's central findings and defines further research possibilities.

2 Literature

To analyze literature regarding the research question, three research streams have been considered. Firstly, research concerning the procurement of third-party logistics (3PL) services is of special importance. Secondly, the involvement of sustainability in third-party logistics research has to be considered. Thirdly, research in the field of Corporate Social Responsibility (CSR) contributes to the formulated question. Research on CSR seems to be relevant because literature emphasizes a broad convergence between the concepts of Sustainable Development and CSR (Carroll and Shabana, 2010).

For the year 2010, Klaus et al. (2011) estimate the total volume of logistics services in Europe (EU 27 plus Switzerland and Norway) to 930 billion Euros. 512 billion Euros are outsourced to external logistics service providers, leading to an external procurement rate of 52.0%. This shows the particularly importance of logistics services procurement. Previous research on logistics service procurement mainly focused on procurement process frameworks and special characteristics and

requirements relating to different process steps (Andersson and Norrman, 2002; Bagchi and Virum, 1998; Sink and Langley, 1997). Furthermore, logistics service providers' selection criteria have played an important role in recent literature (Marasco 2008; Selviaridis and Spring, 2010). Van Laarhoven et al. (2000) identify cost reduction, service improvements and flexibility as central selection criteria. Selviaridis and Spring (2007) additionally mentioned reliability, responsiveness to requests and financial stability as decisive selection criteria. Wolf and Seuring (2010) stated that procurement decisions are still made under consideration of these traditional criteria and that environmental concerns are not being included until now.

Lieb and Lieb (2011) stated significant commitment to environmental sustainability in the 3PL-industry. Even the economic and financial crises didn't lessen the commitment of those companies (Lieb and Lieb, 2011). They reveal pressure from customers as one of the main reasons for sustainable activities by third-party logistics service providers. Despite of various sustainable activities conducted by 3PL-companies sustainable issues aren't a major determining factor in contractual agreements (Lieb and Lieb, 2010).

The concept of sustainability defines sustainable development as a development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." (United Nations, 1987, p. 16) The concept's central message is the demand of a more equitable distribution of the planet's resources and fair development opportunities for people in the world. Sustainable development is differentiated into three interdependent dimensions: economic, ecological and social sustainability (Dyllick and Hockerts, 2002; Seuring and Müller, 2008a). The concept goes far beyond individual economic considerations and constitutes a principle-based approach for a long-term potential-oriented design of humanity's living conditions in general. Essential for achieving sustainable development is the consideration of this principle by the individual economic entities' decisions. Since there is a considerable impact of logistics activities on the environment and on the occupational conditions, sustainability is also a matter in the procurement of logistics services.

Literature generally mentions external pressure through laws and regulations, greater public vigilance and the social and environmental requirements of a growing group of clients as reasons or motives for sustainable actions (Green et al., 1996; Seuring and Müller, 2008a; Seuring and Müller, 2008b; Walton et al., 1998;). Of particular importance is the alignment of corporate behaviour and of each member of the organization with legal rules and regulations, internationally recognised standards and corresponding organization's internal rules (Baumöl, 2009). Furthermore, some authors tried to demonstrate positive correlations between sustainable, especially ecologically sustainable actions and traditional economic key figures (Rao and Holt, 2005). They intend to legitimize the aim of sustainable development from a short term economically rational perspective.

In general the production and use of services coincide. The same applies to logistics services. Consequently, ex-ante considerations of service quality through intensive

evaluation of the service providers' capabilities are more important than ex-post evaluations of the achieved quality. Therefore, the consideration of the service providers' capabilities plays an important role in the selection process. In general the choice of logistics service providers is made by buying-centers, especially in the case of long term relationships (Large and Kovács, 2001). However, a purchaser has a substantial responsibility for the provider's future performance because the evaluation of the provider's capabilities belongs to his working area. In addition to traditional criteria for the selection of logistics service providers the purchaser can consider the service provider's conformable behaviour regarding legal and ethical standards. In the area of procurement, for example employment law or environmental legislation, are of importance. A comprehensive moral standard is the concept of sustainability, which represents the needs of a wide range of social groups. Moreover, sustainability is not only a concept. The national governments entered into commitments to progress sustainable development by the implementation of national development strategies. These strategies could serve as guidelines for individual micro-economic decisions.

While the term Sustainable Development appears in the early 2000s, CSR has a long-standing stream in research history (Carter, 2005). In a common definition the European Union defines CRS as "the integration by companies of social and environmental concerns in their business operations and in their interaction with stakeholders on a voluntary basis" (Commission of the European Communities, 2001b). Both concepts cover an economic, ecological and social dimension (Ciliberti et al., 2008). Within the broad field of CSR, the concept of Logistics Social Responsibility (LSR) addresses such issues "that relate specifically to socially responsible logistics management" (Carter and Jennings, 2002, p. 146). Carter and Jennings (2002) distinguish purchasing, transportation and warehousing as the three main functional areas performing logistics activities. Based on this, Ciliberti et al. (2008) developed a taxonomy of Logistics Social Responsibility practices. They distinguish the five areas of Purchasing Social Responsibility (PSR), Sustainable Transportation (ST), Sustainable Packing (SP), Sustainable Warehousing (SW) and Reverse Logistics (RL).

In the first instance, from the customers' point of view, PSR is of particular importance. PSR can be understood as "socially responsible supply management activities" (Carter 2005, p. 177). In literature a term labeled Social Responsible Buying (SRB) is also used to define PSR (Ciliberti et al., 2008) as "the inclusion in purchasing decisions of the social issues advocated by organizational stakeholders" (Maignan et al., 2002, p. 642). Concerning the research question, the other four areas relate to activities potentially performed by third-party logistics services providers. Within this taxonomy ST, SP, SW and RL practices are conducted by the providers, while customers' PSR practices influence providers' activities.

3 Fields of Activity in Logistics Service Buying

3.1 Governmental Initiatives

With regard to the United Nations' definition of sustainable development the European Union stated sustainable development as its fundamental goal (Commission of the European Communities and Eurostat, 2005). As an integral part of their sustainable development strategy the European Commission points out the measurement of sustainable development progress. Therefore, in 2005 the European Commission developed a set of 155 indicators to measure the progress of sustainable development in Europe concerning 10 mayor themes as part of a hierarchical theme framework. Eurostat has published three monitoring reports, in 2005, 2007 and 2009 for documenting the implementation of the strategy's objectives and key challenges (Eurostat and Commission of the European Communities, 2009).

The German Sustainable Development Strategy is the formal commitment of the German Government to contribute to the global objective of sustainable development. Therefore, this strategy directly refers to the European Union's sustainable development plan and the United Nations Conference Report on Environment and Development and points out the need for national governmental efforts (Federal Government of Germany, 2002; United Nations, 1993). Several topics are obviously influenced by logistics services of individual companies in industry and trade. As shown above, in Germany a significant share of these services is delivered by third party-logistics providers. Hence, some of the topics mentioned in the Sustainable Development Strategy also refer directly or indirectly to the procurement of logistics services.

In addition to the mission statement and national priorities of sustainable development the German Sustainable Development Strategy contains 21 indicators and corresponding measures. There exist statistical data for each determined measure, and target levels for each measure are defined (Federal Government of Germany, 2002). The Federal Statistical Office of Germany has published so far three monitoring reports, in 2006, 2008 and 2010. Out of these 21 indicators 9 correspond to the five fields of activity deduced as follows. The indicators are shown in the Appendix.

Based on these indicators (Federal Government of Germany, 2002), the five characterized fields of activity are:

- Reduction of transport intensity and emission
- Reduction of land use
- Choice of carrier under considerations of sustainable aspects
- Permanent improvement of working conditions
- Improving qualified employment

3.2 Field of activity 1: Reduction of transport intensity and emissions

This field of activity aims to reduce greenhouse gas, freight transport intensity, and air pollution. Freight transport intensity is to be reduced in order to reach economic growth devoid of analogous rise in shipping quantity and -distance. To date economic growth has been reached by a disproportionate rise in shipping extent.

Decrease in freight transport intensity is in the narrow sense no primary field of the procurement of logistics services, since transport demand planning occurs ahead of the procurement of logistics services. Björklund (2011), for instance, just showed different influencing factors, which can allow, advance or constrain ecological procurement of transport services. Especially a consequent regionalization of procurement, production, sales, and consumption decisions cause a decrease in transport intensity (Halldórsson et al., 2009).

However, the avoidance of transports and the shortening of transport distance can be considered by the procurement of logistics services (Carter and Jennings, 2002). A purchasing company willing to enable sustainable activities by their logistics services providers can allow groupage freight solutions when assigning collection and distribution transports. Literature towards Sustainable Transportation discusses numerous strategies and practices that can be suggested as supportive of sustainable development (e.g. Deakin, 2001; Ciliberti et al. 2008). Almost exclusively they refer to efficient or environmentally friendly transportation. As indicators for the extent purchasers influence ecologically sustainable actions by logistics service providers in this field of activity the following four practices are selected: (i) Usage of emissionreduced trucks (e.g. Deakin, 2001), (ii) Usage of emissionreduced tires (e.g. Smith, 2008), (iii) Performance of drivers training in order to reach environmentally conscious driving behaviour (Lieb and Lieb, 2010) and (iv) consideration of emission values in truck procurement (e.g. Ciliberti et al., 2008).

3.3 Field of activity 2: Reduction of land use

One central goal of the German Sustainable Development Strategy is to reduce the daily increase of land use to 30 hectares. At present there is a daily increase in the amount of land used for human settlements and transport infrastructure around 113 hectares. Although, changing demands for living space are identified as the main reason, the purchasers of logistics services can contribute to this goal within this field of activity because the provision of logistics services is land-intensive.

At present, ecological impacts concerning the construction and operation of warehouses were investigated relating to transportation volumes and power requirements. However, the construction of new warehouses leads to a considerable amount of land use. Especially concerning the selection of a logistics service provider for establishing a long term, specific asset based relationship, the criteria of land use can be included into the evaluation process. Frequently the purchasing companies expect customized services and therefore specific site investments of their providers

(Large et al., 2011). This often leads to the construction of new warehouses and facilities. Alternatives could be the use of existing vacant storage facilities (Carter and Jennings, 2002). In order to enable ecologically sustainable activities by their logistics service providers the purchasing company can allow the usage of multi-user warehouses (Ciliberti et al., 2008). If such solutions don't seem to be appropriate it can be considered to abandon a construction of new buildings on "greenfield sites". In Germany approximate 5% of existing settlement areas is unused (Federal Statistical Office, 2011). Therefore, in future it could be assessed, if area, which had already been sealed, could be used by logistics service providers as locations for warehousing.

In general, the goal to reduce land use can be seen as a part of Sustainable Warehousing practices. In comparison to ST, SW practices are known even less (Ciliberti et al., 2008). Based on practices discussed in literature as indicators for the extent purchasers influence ecologically sustainable actions by logistics service providers in this field of activity (i) the reduction of energy usage (Lieb and Lieb, 2011) and (ii) the usage of renewable energies in warehouse operations (Lieb and Lieb, 2010) are selected. Furthermore, with particular focus on the reduction of land use two possible practices have been added: (iii) avoidance of new soil sealing and (iv) consideration of environmental aspects in property selection.

3.4 Field of activity 3: Choice of carrier under considerations of sustainable aspects

Concerning the transport of goods services the German Sustainable Development Strategy as well as the European strategy explicitly requests the extension of rail and inland waterways. The central goal within this field of activity consists in the support of modal shift (Federal Government of Germany, 2002). By promoting environmentally friendly means of transport, sustainably positive effects on the use of resources, on climate protection and on air quality are expected.

This refers directly to the procurement of logistics services, because the selection of a logistics service provider is closely associated with the provision of services and the mode of transport's choice. Moreover, purchasing companies can point out shippers' possibilities of choosing ecologically sustainable transport modes, especially combined transports. Traditionally, shippers make use of combined transport (Bontekoning et al., 2004), but it is also noted in literature that logistics service providers as customers of transport services are much more sceptical towards combined transports than industrial carriers (Patterson et al., 2010). Above all, operational managers of logistics service providers seem to be less sensitive to environmental protection and the conservation of natural resources. A purchasing company willing to enable sustainable activities by their logistics service providers can accept extended transportation time caused by using different modes of transport.

In literature the use of more sustainable modes of transport is discussed as practice in the field of Sustainable Transportation (Ciliberti et al., 2008). Eng-Larsson and Kohn (2012) investigated success factors of modal shift from a shipper's perspective. Based on their work the following four practices are developed as indicators for the extent purchasers influence ecologically sustainable actions by logistics service providers in this field of activity: (i) usage of rail and/or ship through cargo consolidation, (ii) establishment of cooperations in order to reach cargo consolidation, (iii) establishment of cooperations with providers of environmentally friendly transport services and (iv) information on possible usages of combined transport.

3.5 Field of activity 4: Permanent improvement of working conditions

A further essential field of activity against the background of socially sustainable development is the improvement of working conditions, especially of operative staff. The working conditions especially of drivers are addressed in recent LSR literature (Ciliberti et al., 2008; Carter and Jennings, 2002). Nevertheless, social practices seem to be no essential part of sustainable activities in practice (Ciliberti et al., 2008). Often, their working conditions are characterized by long working hours, low wages, high physical and mental stress and little recognition by the management. For example, there exist deadlines and time pressure, work at night and on weekends, long and changing work schedules, long absences from home and physically strenuous additional work (Carter and Jennings, 2002).

Especially in general cargo transportation main working has to be made in the evening and at night to deliver at time. The purchasing company can design their production planning in order to enable deliveries during the day and on week days. But it can be assumed that despite the consideration of working hours it cannot be prevented totally in logistics operational activities.

To design an adequate workplace the descent time pressure is of high importance to consider the amount of work, deadline constraints and necessary working speed. A purchasing company, willing to enable sustainable activities by their logistics service providers, can support their providers of logistics services to reduce time pressure by early disclosure of order related information und flexible dates and time frames.

Another important aspect is an adequate remuneration (Lane, 1987; Corsi and Grimm, 1989; Carter and Jennings, 2002; Ciliberti et al., 2008). The purchasing company can gather information about the wage structure of potential logistics service providers. This information can be considered during the selection process. Furthermore, the purchasing company can safeguard by contract the providers' compliance with regulations regarding minimum wages. The same applies to the high insecurity of employment caused by a large number of temporary employed workers (Gonos and Martino, 2011), which leads to an operational stuffs' mental stress. The purchasing company can influence the providers of logistics services to minimize the

employment of temporary workers. Summing up, as indicators for the extent purchasers influence socially sustainable actions by logistics service providers in this field of activity the following four practices are selected: (i) provision of services during the day and on weekdays (Carter and Jennings, 2002), (ii) to keep the payment of standard wages (Corsi and Grimm, 1989), (iii) to grant the payment of premium wages for night and weekend shifts (Gonos and Martino, 2011) and (iv) to minimize the usage of temporary workers (Gonos and Martino, 2011).

3.6 Field of activity 5: Improving qualified employment

Approximately 2.7 Million People in Germany are employed in the logistics services industry. It could be observed that the logistics service industries growth rates of people in employment are much higher than in the economy as a whole. Although some of this increase is caused by shifting jobs from industry and trade to third-party providers, this industry contributes crucially to the long term goal of increasing the national employment rate (15- to 64-year-olds).

However, the logistics industry is characterized by a comparatively high ratio of low qualified and low paid employment, especially on the operative level. Practice discusses vocational education and trainings as one way to improve prospects of employment in logistics (Gardner, 2007). In addition, a greater variety of promotion prospects and career opportunities can contribute to qualified employment. Purchasing companies have the possibility to consider these aspects during the selection process of logistics service providers. The purchasing company can request information on providers´ offered opportunities for apprenticeships, trainings and career opportunities (e.g. Székely and Knirsch, 2005).

The German Sustainable Development Strategy, as well as the European strategy, focuses on earning and work capacity of older people. Health is a decisive factor in order to be employable when advanced in years. Operational activities in logistics, especially in the low-wage sector, often cause increased physical strain, which can lead to health problems and disabilities. To address this concern logistics companies can give special attention to ergonomic workplace design (González-Munoz and Gutiérrez-Martínez, 2007) and implementation of health workshops. During the selection process and the contract design the purchasing company can consider ergonomic requirements, observance of working hours and the providers´ compliance with health and safety regulations at work (Carter and Jennings, 2002). There is also the possibility of performing audits and asking for sheltered workplaces and special job creation schemes for elder people. Based on this, the following five indicators for the extent purchasers influence socially sustainable actions by logistics service providers in this field of activity are defined: (i) to offer opportunities for apprenticeships (ii) to offer opportunities for trainings (Carter and Jennings, 2002), (iii) to offer opportunities for career progressions (Carter and Jennings, 2002), (iv) to offer ageappropriate workstations (e.g. Deakin, 2001), (v) to consider ergonomic aspects in workplace design (González-Munoz and Gutiérrez-Martínez, 2007) and

(vi) consistent compliance with health and safety regulations at work (Carter and Jennings, 2002).

4 Methods

Literature and the European as well as the German Sustainable Development Strategy emphasize the importance of sustainable procurement of logistics services. In order to answer the comprehensive research question and to design an applicable questionnaire more detailed research questions are derived.

Initially, respondents were asked, if they are involved in purchasing (i) transportation services, (ii) warehousing services, (iii) transportation and warehouse services or (iv) none of them. Depending on this, questions regarding the five defined fields of activity were assigned.

To get a general overview of the involvement of sustainable aspects in purchasing practice respondents were asked general questions regarding the five fields of activity. Within this question respondents rated (i) the importance of each field, (ii) the consideration of each field as selection criteria and (iii) the company's influence on logistics service providers' actions.

The main part of the questionnaire is structured by the five fields of activity. Within each part subquestions were striven to be answered. Cowan et al. (2010) argue that as a central part of improving sustainability companies have to look at their own contribution. Especially within buyer-supplier relationships the buying company can think of their own contribution to enable suppliers' sustainable actions. Following this idea, the first subquestion is:

- How strong is the purchasing companies' willingness to enable logistics service providers' sustainable activities?

Ciliberti et al. (2008) stated that information and communication activities towards suppliers are often used in PSR practice and of particular importance. Also Perrini (2005) views communication and information as important topic of social responsible supplier management. Therefore, information and communication is incorporated in the questionnaire and forms the second subquestion:

- To what extent purchasing companies inform and communicate sustainable aspects in business relationships with logistics service providers?

Based on the literature part, the description of the five fields of activity and the indicators developed within, the third subquestion is defined as follows:

- To what extent purchasing companies influence sustainable actions of logistics service providers?

In conclusion questions were asked regarding preconditions for the consideration of sustainable aspects. Next to external conditions like pressure from customers or laws and regulation, literature as well emphasizes organizational preconditions (Carter

and Jennings, 2004) and personal values and initiatives of the top management (Székely and Knirsch, 2005) and employees (Collier and Esteban, 2007) in order to realize sustainable actions. This raises the question:

- Which preconditions for the consideration of sustainable aspects in the procurement of logistics services exist for purchasing companies?

The questionnaire was sent by e-mail to 750 purchase and logistics managers in November 2010. The given response categories range from 1 (do not agree) to 7 (highly agree). The sample was drawn from a mailing list of the University. As usual for web-based surveys the number of people who quit the survey on the questionnaire's first page was rather high (Grant et al., 2005). 149 persons took part in the questionnaire. Of these, 34 datasets were dropped because of missing data or constantly equal values. Therefore, 115 data were available for further analysis. Based on the number of questionnaires distributed, the response rate is 15.3%. Figure 1 shows the distribution of respondents regarding their functional involvement and the companies' size.

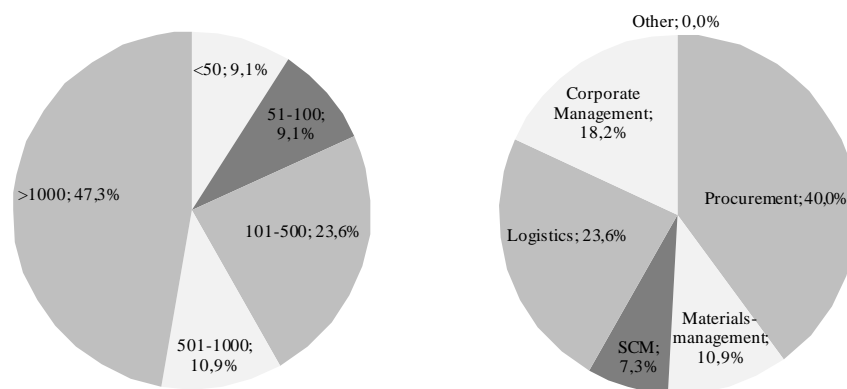


Figure 1: Companies' size (number of employees) and functional involvement

In line with previous studies (Large and Kovács, 2001) the distribution of respondents shows different organizational functions involved in purchasing logistics services. Consequently, the development of practices to promote sustainable actions in purchasing logistics services has to be addressed to different functional areas as well as different hierarchy levels (corporate management and middle management levels).

5 Results and Discussion

5.1 Consideration of sustainable aspects in procurement

Concerning the importance of the fields of activity, their consideration as a selection criterion during the decision process of choosing a logistics service provider as well as the purposeful influence on the chosen service provider in this regard, a mean approval is shown (Table 1). The relatively high standard deviations point out a strong dispersion about the mean.

It is conspicuous that few respondents show a very high agreement while the majority of respondent have little approval. For instance, concerning the exertion of influence on the use of railway and/or inland water vessel 41.6% of the respondents give values of 1 or 2. A high approval is shown concerning the importance of the improvement of working conditions; 28.9% of the respondents give the maximal value of 7.

The findings also show that, concerning all five fields of activity, the agreement decreases starting with a high approval for the importance, a lowered approval for the consideration during the selection process and the lowest approval for exerting influence on the provider's actions. This seems to point out that the awareness of the importance of sustainability does not necessarily lead to a precise influence on the service providers' actions. However, this result should be also discussed in the light of a possible bias caused by social-desirability-responses (Randall and Fernandes, 1991). Maybe the respondents presented themselves in a too positive way, because they know that sustainability should be important and that the researchers expect a high degree of agreement. Although we cannot eliminate any possibility of this bias, the relevance in this case seems to be low, because the data was collected anonymously by means of a web-based questionnaire. It also becomes apparent that the importance of the social dimension of sustainability (improvement of working conditions; improving qualified employment) is considered to a comparable extension as the ecological dimension. The respective precise influence rates exhibit almost the same values. The continuously lowest levels of agreement are shown in the third field of activity "Choice of carrier under considerations of sustainable aspects". This can be explained by the fact that this field of activity is traditionally left to the logistics service provider.

Table 1: Consideration of sustainable aspects in procurement

Field of activity		Quantity (n)	Mean	Standard deviation
1. Reduction of transport intensity and emission	Importance	115	4.5	1.9
	Selection criterion	95	4.0	2.0
	Influence	88	3.5	2.0
2. Reduction of land use	Importance	115	4.8	1.7
	Selection criterion	96	4.2	2.0
	Influence	89	3.7	2.0
3. Choice of carrier under considerations of sustainable aspects	Importance	114	3.6	2.0
	Selection criterion	96	3.3	1.9
	Influence	89	3.2	1.9
4. Permanent improvement of working conditions	Importance	114	4.9	2.0
	Selection criterion	95	4.0	1.9
	Influence	89	3.5	2.0
5. Improving qualified employment	Importance	114	4.7	2.0
	Selection criterion	96	4.0	1.9
	Influence	88	3.3	2.0

5.2 Willingness to enable sustainable activity

Regarding the five fields of activity the procuring companies' willingness to enable their supplier to sustainable activity shows different levels of agreement (Table 2). Furthermore the relatively high standard deviations point out a strong dispersion about the mean.

It is conspicuous that higher levels of approval are found concerning measures which are clearly rational from an economic perspective. For instance, most purchasers allow the transport of their goods in consolidation with goods of other carriers (field of activity 1). Also they allow the use of multi-user-warehouses (field of activity 2). The found frequencies back up this evidence. 67.1% show a strong or very strong willingness to the allowance of groupage freight. 47.9% show a strong or very strong willingness to the allowance of using multi-user-warehouses.

Comparatively high means concerning an early transmission of assignment information (field of activity 4) can be explained by purchasers' benefits. Low means within the fifth field of activity (improving qualified employment) are conspicuous. 55.4% (encouragement of qualified employment) and 63.1% (encouragement of age-based integration of employees) of the respondents show a very low or no willingness to enable the logistics service provider to sustainable activities within in these fields. Since their importance receives a mean value of 4.7 (chapter 4.1), it seems, that the purchasing company does not find a way in order to enable sustainable activity in this field. Moreover this difference can be explained by the assumption that the purchasing company does not assume to be responsible for these criteria of social sustainability.

Table 2: Willingness to enable sustainable activity

Field of activity		Quantity (n)	Mean	Standard deviation
1. Reduction of transport intensity and emission	Allowance of groupage freight	73	5.7	1.7
2. Reduction of land use	Allowance of using multi-user-warehouses	48	4.9	2.0
3. Choice of carrier under considerations of sustainable aspects	Acceptance of extended transportation time through Modal Split	70	3.3	1.9
4. Permanent improvement of working conditions	Early disclosure of order related information	65	4.7	1.7
	Flexible dates and timeframes	64	3.4	1.9
5. Improving qualified employment	Encouragement of qualified employment	65	2.9	2.1
	Encouragement of age-based integration of employees	65	2.4	1.7

5.3 Consideration of sustainable aspects through information and communication

Regarding the five fields of activity, Table 3 shows to which extent purchasers are informed of the sustainable activities of their logistics service providers (Information). It also shows to which extent sustainable aspects are addressed within the communication with the logistics service provider (communication). The mean values of information tend to be higher than mean values of communication. Relatively high standard deviations are shown continuously. Contrary to the general consideration of sustainable aspects in procurement of logistics services (4.1) high frequencies of low and middle rates of approval are revealed. Communication about the reduction of pollutant emission (field of activity 1), for instance, does not apply or only to a small degree by 41.4% of the respondents.

It is conspicuous that in all five fields of activity the mean values of information and communication are located below the mean values of the consideration of sustainable aspects during procurement process (4.1). This shows that the importance as well as the consideration of sustainable aspects during the procurement process is transferred into information search and communication with the supplier only to a minor degree.

Table 3: Consideration of sustainable aspects through information and communication

Field of activity		Quantity (n)	Mean	Standard deviation
1. Reduction of transport intensity and emission	Information	72	3.6	1.8
	Communication	73	3.3	1.9
2. Reduction of land use	Information	48	4.0	1.8
	Communication	48	3.5	1.9
3. Choice of carrier under considerations of sustainable aspects	Information	70	3.3	1.9
	Communication	70	3.2	1.8
4. Permanent improvement of working conditions	Information	65	3.0	1.8
	Communication	65	2.8	1.8
5. Improving qualified employment	Information	65	3.0	1.9
	Communication	64	3.0	2.0

5.4 Direct influence on ecologically sustainable actions

Regarding direct influences by the purchaser on the service providers' ecologically sustainable actions, low levels of agreement are shown almost consistently (Table 4). Questions regarding sustainable stocking (field of activity 2) are predicated on a smaller data base. This is founded on the fact that a smaller part of the respondents is involved in the procurement of stocking services than in the procurement of transport services.

According to the frequency distribution concerning questions about information and communication (4.3) relatively high frequencies of little and medium agreement are shown. For example, direct influence on the establishment of cooperations in order to

reach cargo consolidation (field of activity 3) does not or only to a small degree apply for 58.2% of the respondents.

Answers concerning the usage of emission reduced trucks, the consideration of emission values in truck procurement (field of activity 1), and concerning information on possible usages of combined transport (field of activity 3) show the highest mean values. The consideration of these aspects causes reductions in costs, because of reduced fuel consumption. This could explain the high mean values concerning these questions. Sustainable aspects which do not have a direct impact on cost reduction show the lowest agreement levels in this category. One example is the avoidance of new soil sealing.

Table 4: Direct influence on ecologically sustainable actions

Field of activity		Quantity (n)	Mean	Standard deviation
1. Reduction of transport intensity and emission	Usage of emissionreduced trucks	70	3.5	2.1
	Usage of emissionreduced tires	70	2.8	1.8
	Performance of drivers training in order to reach environmentally conscious driving behaviour	70	2.7	1.8
	Consideration of emission values in truck procurement	70	3.2	2.1
2. Reduction of land use	Avoidance of new soil sealing	48	2.5	1.8
	Consideration of environmental aspects in property selection	47	2.6	1.9
	Reduction of energy usage through constructional measures	48	3.0	2.0
	Usage of renewable energies in warehouse operations	48	2.7	1.8
3. Choice of carrier under considerations of sustainable aspects	Usage of rail and/or ship through cargo consolidation	67	2.7	1.9
	Establishment of cooperations in order to reach cargo consolidation	67	2.6	1.9
	Establishment of cooperations with providers of environmentally friendly transport services	66	2.6	1.7
	Information on possible usages of combined transport	66	3.0	2.0

5.5 Direct Influence on socially sustainable actions

Regarding direct influences by the purchaser on the service providers' socially sustainable actions, low levels of agreement are shown almost consistently (Table 5). Only the direct influence on the provision of services during the day and on weekdays (field of activity 4) as well as the consistent compliance with health and safety regulations at work (field of activity 5) show higher agreement levels. Frequency distributions draw a similar picture as seen at the direct influence on ecological sustainable actions. Mostly high agreement rates are lessened by little or no agreements.

It is conspicuous that 51.5% of the respondents show little or no direct influence on keeping the payment of standard wages and 63.6% of the respondents show no direct influence on minimizing the usage of temporary workers. Demonstrated by the mean values concerning the possibilities of direct influence, companies show the same level of efforts concerning direct influence on socially and ecologically sustainable actions. This complies with the consideration of sustainable aspects in procurement in chapter 4.1. On the contrary, logistics science preferentially centers investigations on the ecological aspects of sustainability.

Table 5: Direct influence on socially sustainable actions

Field of activity		Quantity (n)	Mean	Standard deviation
4. Permanent improvement of working conditions	Provision of services during the day and on weekdays	65	4.3	1.9
	To keep the payment of standard wages	66	3.2	2.3
	To grant the payment of premium wages for night and weekend shifts	65	2.8	2.0
	To minimize the usage of temporary workers	66	2.5	1.8
5. Improving qualified employment	To offer opportunities for apprenticeships	63	2.7	2.1
	To offer opportunities for trainings	61	3.0	2.2
	To offer opportunities for career progressions	64	2.5	1.9
	To offer ageappropriate workstations	64	2.5	1.9
	To consider ergonomic aspects in workplace design	64	3.0	2.2
	Consistent compliance with health and safety regulations at work	64	4.3	2.5

5.6 Preconditions for the consideration of sustainable aspects

The investigation shows that the importance of ecologically and socially sustainable actions in the procurement of logistics services gets more agreement than the factual implementation of such actions. Since the likeliness of social-desirability-responses is low, this indicates that there are constraints which restrain the transformation of the perceived importance of sustainable actions into factual activity. Decrease of these constraints can be exposed as a requirement to put sustainable actions in procurement of logistics services into effect. Table 6 shows the respondents' agreement level regarding the importance of different preconditions in order to consider sustainable aspects when procuring logistics services.

Table 6: Preconditions for the consideration of sustainable aspects

	Quantity (n)	Mean	Standard deviation
Consideration as part of individual remit	70	5.1	1.7
Existence of financial flexibility	71	5.3	1.4
Avoidance of competitive disadvantages	71	6.0	1.5
Existence of knowledge and information on sustainable development	71	5.7	1.3
Existence of organisational support	71	5.6	1.4
Existence of procurement flexibility	70	5.6	1.5
Existence of a special interest of the purchaser	71	5.1	1.6

Conspicuous are the high and very high agreement levels. For companies it is of particular importance that they will not suffer any competitive disadvantage caused by their commitment to sustainable development. Moreover knowledge and information about possibilities of sustainable actions as well as organizational support and a corresponding room for manoeuvre are important preconditions. This is also shown by frequency distribution. 87.3% of the respondents note, that caused by sustainable actions there may not occur competitive disadvantage to their company. Moreover, the agreement level of 75.5% of the respondents shows the necessity of a corresponding financial scope of action in order to put in effect ecologically and socially sustainable actions when procuring logistics services.

The investigation points out that the consideration of ecological and social aspects of sustainable development is closely related to economic issues. A fundamental precondition for sustainable procurement of logistics services can be seen in the purchasing companies' awareness of the need for integrating sustainable aspects in economic decisions. Sustainable logistics service procurement operations are carried out under consideration of economic aspects. Further research can explore main requirements which are necessary for integrating ecological and social issues in economic considerations. It becomes clear that further research has to cope with the problem to combine normative aspects of sustainable development with practice-oriented economic issues.

In comparison to existing taxonomies and practices the results show different emphases and make some contributions. It can be stated that the first field of activity (reduction of transport intensity and emission) focuses on a special part of Sustainable Transportation. Similarly, the third field of activity (choice of carrier under considerations of sustainable aspects) relates to transportation but discusses more detailed modal shift-related sustainability practices barely noticed in practice and LSR literature.

The second field of activity can be seen as part of Sustainable Warehousing but it emphasizes explicitly the reduction of land use which is, only to some extent, considered in practice. The developed fields of activity have a special emphasis on the social dimension of sustainability. Given recent taxonomies social aspects are dispersed among different categories like human rights, safety, ethics, philanthropy

or quality of life for drivers (Carter and Jennings 2002; Ciliberti et al. 2008). The suggested fields of activities bundled social practices into the two categories of “improvement of working conditions” and “improvement of qualified employment”. In addition, the idea of considering purchasing companies’ own contribution and willingness to enable logistics service providers’ sustainable activities is emphasized.

6 Conclusion and Further Research

The five defined fields of activity give a reference framework for discussing possibilities of ecologically and socially sustainable procurement of logistics services in order to contribute to the realization of the goals of the European and German Sustainability Development Strategy.

In practice these five fields of ecologically and socially sustainability are considered to be important. However, they don’t seem to be considered as criteria during the selection process with the same intensity. Furthermore, purchasing companies influence logistics service providers to a minor extent regarding ecologically and socially sustainable actions. Comparing the five fields of activity among each other, the sustainable criteria of choosing mode of transports (field of activity 3) receives the slightest consideration. Currently, gathering information and communication about the five fields of activity are lagging behind the declared importance of each field of activity. Furthermore, direct influence of purchasing companies on the logistics service providers’ sustainable actions is put into effect especially in the case of achieving economic goals at the same time. The realization of the European and German Sustainability goals fades into the background. Especially actions within the fifth field of activity (Improving qualified employment) receive little attention. With regard to the high-pressure work situations, especially of operational staff, the need for action is clearly evident.

Taking into account the almost explorative nature of the questionnaire, the low number of responses and the suggestion that rather sustainably committed respondents completed the questionnaire, the results present a first impression of the extent purchasers of logistics services take into account aspects of sustainable development. In order to reach further generalizability of the results more sophisticated statistics could be used.

Support and direct influence of the purchasing companies can be one way to enable changes. This investigation presents decisive preconditions for ecologically and socially sustainable actions and their link with economic aspects. Therefore, further research could explore possibilities to link the three dimensions of economic, ecological and social sustainability.

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Appendix: Logistics related indicators and goals of the German Sustainable Development Strategy

N ^o .	Indicator areas		Indicators	Goals
1	Resource protection <i>Using resources economically and efficiently</i>	a	Energy productivity	Doubling between 1990 and 2020
		b	Raw material productivity	Doubling between 1994 and 2020
2	Climate protection <i>Reducing greenhouse gases</i>		Greenhouse gas emissions	Reduction of 21 % compared to 1990 until 2008/2012 and of 40 % until 2020
3	Renewable energies <i>Strengthening a sustainable energy supply</i>	a	Share of renewable Energy sources in total primary Energy consumption	Increase to 4.2 % by 2010 and to 10 % by 2020
		b	Share of renewable Energy sources in electricity consumption	Increase to 12.5 % by 2010 and to at least 30 % by 2020
4	Land use <i>Sustainable land use</i>		Increase in land use for housing and transport	Reduction in daily increase to 30 hectares by 2020
5	Species diversity <i>Conserving species – protecting habitats</i>		Species diversity and landscape quality	Increase to the index value 100 by 2015
6	National debt <i>Consolidating the budget – creating intergeneration equity</i>		National deficit	Structurally balanced public spending; Federal budget without net borrowing from 2011 at latest
7	Provision for future economic stability <i>Creating favourable investment conditions – securing long-term prosperity</i>		Gross fixed capital formation in relation to gross domestic product (GDP)	Increase in the share
8	Innovation <i>Shaping the future with new solutions</i>		Private and public spending on research and development	Increase to 3 % of GDP by 2010
9	Education and training <i>Continuously improving education and vocational training</i>	a	18- to 24-year-olds without a school leaving certificate	Reduction in proportion to 9 % by 2010 and 4.5 % by 2020
		b	25-year-old university graduates	Increase in proportion to 10 % by 2010 and 20 % by 2020
		c	Share of students starting a degree course	Increase to 40 % by 2010, followed by further increase and stabilization at a high level
10	Economic prosperity <i>Raising economic performance by environmentally and socially compatible means</i>		Gross domestic product per capita	Economic growth
11	Mobility <i>Guaranteeing mobility – protecting the environment</i>	a	Intensity of goods transport	Reduction to 98 % in comparison to 1999 by 2010 and to 95 % by 2020
		b	Intensity of passenger transport	Reduction to 90 % in comparison to 1999 by 2010 and to 80 % by 2020
		c	Share of rail transport in goods transport performance	Increase to 25 % by 2015
		d	Share of inland water transport in goods transport performance	Increase to 14 % by 2015

N°.	Indicator areas		Indicators	Goals
12	Farming <i>Environmentally sound production in our cultivated landscape</i>	a	Nitrogen surplus	Reduction to 80 kg/hectare on land used for agriculture by 2010, further reduction by 2020
		b	Organic farming	Increase of the share of organic farming on land used for agriculture to 20 % in coming years
13	Air quality <i>Keeping the environment healthy</i>		air pollution	Reduce to 30 % compared to 1990 by 2010
14	Health and nutrition <i>Living more healthily for longer</i>	a	Premature mortality (cases of death per 100,000 residents under 65) men	Reduction to 190 cases per 100,000 by 2015
		b	Premature mortality (cases of death per 100,000 residents under 65) women	Reduction to 115 cases per 100,000 by 2015
		c	Proportion of adolescents who smoke (12- to 17-year-olds)	Decrease to under 12 % by 2015
		d	Proportion of adults who smoke (15 years and older)	Decrease to under 22 % by 2015
		e	Proportion of obese people (adults, 18 years and older)	Reduction by 2020
15	Crime <i>Further increasing personal security</i>		Burglaries in homes	Reduction in cases to under 100,000/year by 2015
16	Employment <i>Boosting employment levels</i>	a	Employment rate (total) (15- to 64-year-olds)	Increase to 73 % by 2010 and 75 % by 2020
		b	Employment rate (older people) (55- to 64-year-olds)	Increase to 55 % by 2010 and 57 % by 2020
17	Perspectives for families <i>Improving the compatibility of work and family life</i>	a	All-day care provision for children (0- to 2-year-olds)	Increase to 30 % by 2010 and 35 % by 2020
		b	All-day care provision for children (3- to 5-year-olds)	Increase to 30 % by 2010 and 60 % by 2020
18	Equal opportunities <i>Promoting equal opportunities in society</i>		Gender pay gap	Reduce the difference to 15 % by 2010 and to 10 % by 2020
19	Integration <i>Integration instead of exclusion</i>		Foreign school leavers with a school leaving certificate	Increase in the proportion of foreign school leavers with at least <i>Hauptschule</i> certificate and alignment with quota for German school leavers by 2020
20	Development cooperation <i>Supporting sustainable development</i>		Share of expenditures for official development assistance in gross national income	Increase to 0.51 % by 2010 and 0.7 % by 2015
21	Opening markets <i>Improving trade opportunities for developing countries</i>		German imports from developing countries	Further increase

Source: Federal Statistical Office (2010)