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Who controls transport emissions and who cares? Investigating the monitoring of environmental sustainability from a logistics service provider's perspective

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Abstract

Purpose – The purpose of this paper is to explore the environmental impact of logistics service provider (LSP) activities in the light of customer priorities and the fragmentation of the road haulage industry in Europe. It also explores the extent to which LSPs can actually monitor the environmental impact of logistics activities in the supply chain (SC).
Design/methodology/approach – The research is based on a narrative literature review, an interview study, a case survey and three in-depth case studies. A framework on sustainability challenges in SCs, derived from the literature, is used to structure and analyse the findings.
Findings – Despite the ambitious environmental schemes communicated by several LSPs, they show little interest in, and exert little control over, the actual emissions generated from their transport operations. It is clear from the results that any real concern from customers for environmental solutions which negatively influence the cost and time requirements of logistics services is not yet a reality.
Research limitations/implications – This paper implies that LSP sustainability cannot be investigated in isolation if a company does not manage its proprietary resources (like owning trucks and employing drivers), but rather engage subcontractors.
Practical implications – Environmental policies among different LSPs appear to be similar as policies, but differ in practice. This variation of practices emphasises the importance of follow-up control by environmentally aware buyers of logistics services.
Originality/value – This paper represents a novel approach as to how LSP environmental policies should be viewed. It highlights the concrete need for action to achieve the environmental targets of 2020 and 2050 for carbon emissions from road transportation.

Keywords Supply chain management, Logistics service provider, Greenwash, Haulier, Transport efficiency

Paper type Research paper

1. Introduction

For the past decade, many large companies have published an increasing number of sustainability reports: corporate social responsibility (CSR) reports and codes of conduct (Carter and Rogers, 2008), often as part of their annual reports or as separate documents (Porter and Kramer, 2007). Consequently, these companies are showing an increased interest in, and paying more attention to, the environmental performance of their outsourced activities (Pålsson and Kovács, 2014). Considering the high level of outsourcing of logistics

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activities, and the large volume of emissions these activities account for in the supply chain (SC) (Wu and Dunn, 1994), the environmental performance of logistics service providers (LSPs) becomes both crucial and challenging to address. Rossi *et al.* (2013, p. 595) state that "LSPs feel pressure from their customers, which is the first driver for sustainability […]". Lieb and Lieb (2010) also report on LSPs receiving increased attention from their customers for environmental initiatives (13 per cent of LSPs receive substantial attention and 50 per cent moderate attention). However, how this pressure or attention is transformed into practice is not clear from the relevant literature, especially in large networks of actors involved in supplying logistics services. Furthermore, many firms act in ways to maximise their own profits and not to maximise SC performance (Narayanan and Raman, 2004). As a result, despite the considerable impact logistical activities have on the environment, the way of dealing with environmental challenges in the logistics industry is rather immature (Isaksson and Huge Brodin, 2013). In the literature reviews on third-party logistics providers (3PL) by Selviaridis and Spring (2007), and Marasco (2008), for example, environmental issues are not emphasised as central themes or put forward as areas of interest for further research. Wolf and Seuring (2012, p. 84) report from their study on procurement of logistics services that "While 3PL reports an increasing interest in environmental issues, buying decisions are still made on 'traditional' performance objectives, such as price, quality and timely delivery". In one of the few articles on environmentally focused research from an LSP perspective, Maas *et al.* (2012) conclude that environmental differentiation is only a small part in differentiating LSP offerings and practices, which Isaksson and Huge Brodin (2013) also confirm.

Currently, several large LSPs, including DHL, DSV and Schenker, have CSR policies, but many small and medium-sized LSPs still do not. Little research has been carried out on the challenges LSPs face regarding sustainability (Lieb and Lieb, 2010).

Considering that 3PLs typically own a terminal network but only limited transport resources (e.g. trucks) (Klaas-Wissing and Albers, 2010), it is difficult to influence and monitor emissions of outsourced logistics activities. Freight transport from an LSP perspective is crucial to address, but fragmentation in the industry makes both studying and managing environmental performance very challenging (Sternberg *et al.*, 2013). As shown by Sternberg *et al.* (2013), the road transport market (accounting for the majority of transport emissions) is dominated by small road hauliers, in particular in Europe where small road hauliers (< 20 trucks) make up 70-95 per cent of all road hauliers (Sternberg *et al.*, 2013). The authors (Sternberg *et al.*, 2013) also show in case studies how the efficiency of logistics operations suffers from co-ordination difficulties between a plethora of different actors, due to nested levels of planning and control and a lack of clear areas of responsibility.

How do LSPs perceive and handle the environmentally related requirements of buyers of logistics services? How does the fragmentation of logistics services and the large number of subcontracted service providers, hauliers and subcontractors influence the environmental work and policies of LSPs? In other words, how are the environmental policies of 3PLs applied in practice, and how do these companies work with their subcontracted transport suppliers?

The purpose of this paper is to explore the environmental impact of LSP activities in the light of increased customer priorities and fragmentation of the logistics industry, and the extent to which LSPs can actually monitor and control the environmental impact of logistics activities in the SC.

The next section provides a literature review followed by the research method. Employing a mixed method approach, the research is based on narrative literature review and three empirical investigations: an interview study, a case survey and three in-depth case studies. The case studies provide deeper insights on the results from the interview and case survey studies. The results of the studies are presented, followed by a synthesising discussion, conclusions, implications and suggested further research.

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2. Literature review

With a growing interest over the last ten years in sustainability issues, a number of research studies and frameworks have been published, such as the conceptual frameworks of sustainable supply chain management (SSCM) by Carter and Rogers (2008), and (those of) Seuring and Müller (2008). These have been further developed, and more in-depth studies have been published, e.g. sustainable logistics operations (Dey *et al.*, 2011), resource-efficient SC (Matopoulos *et al.*, 2015), SSCM drivers (Dubey *et al.*, 2017), procurement of logistics services (Large *et al.*, 2013), multi-tier sustainable SCs (Tachizawa and Wong, 2014), greening capabilities of LSPs (Lun *et al.*, 2015), diffusion of environmental practices (Tate *et al.*, 2013), as well as themes and challenges in making SCs sustainable (Abbasi and Nilsson, 2012). Sustainable development in this paper is defined in accordance with the Brundtland Report (World Commission on Environment and Development, 1987) and the United Nations (2005) World Summit as the three bottom lines of social development, environmental protection and economic development.

Transport is a derived demand and as stated in Huemer (2012, p. 263), based on a UPS case study, "there is no product, only delivery". In tenders and, on spot markets, shippers state their requirements and negotiate conditions with LSPs and hauliers. Pålsson and Kovács (2014) found in their study that shippers generally work with transport sustainability as a measure to achieve long-term strategic advantage. Large *et al.* (2013, p. 125) provide four areas for purchasing companies to influence LSPs to act in ecologically sustainable ways: "(i) usage of rail and/or ship through cargo consolidation, (ii) establishment of co-operations in order to reach cargo consolidation, (iii) establishment of co-operations with providers of environmentally friendly transport services and (iv) information on possible use of combined transport". However, as highlighted by Tachizawa and Wong (2014), lower-tier suppliers, such as hauliers, make it complicated for shippers to manage their environmental performance due to business distance and influence (often several tiers away), little environmental pressure from society (due to their relative small size) and often unmaintainable business relationships (short contract periods). Consequently, there are a number of challenges due to both the nature and set-up of transport and logistics services in SCs, but at the same time, transport is one of the single greatest sources of environmental impact (IPCC, 2007). The framework by Abbasi and Nilsson (2012) presents five categories of challenges faced by SCs in becoming sustainable. These are costs, complexity, operationalisation, mindset and cultural changes and uncertainties. The cost category considers the costs associated with the development and maintenance of sustainable logistics solutions and infrastructure (e.g. services, fuels, technologies, education and training) as well as difficulties in assessing the costs of environmental degradation and the payback dimension of any green/sustainable solution. The second category, complexity, covers the interrelated aspects and factors of sustainable development, involving paradoxes and non-reducible problems. The third category, operationalisation, deals with both the difficulties in interpreting the requirements of sustainable development, and the organisational inertia found in most organisations as well as consumers when it comes to making sustainable development a reality. Mindset and cultural changes refer to the attitudes, knowledge and approaches different stakeholders have towards sustainable development. Finally, uncertainties cover both the regulations and policies which governments propose and implement, and long-term developments covering technology breakthroughs and market changes.

3. Methodology

To meet the research purpose and to ensure understanding of the different factors involved, a research design was selected, consisting of an initial narrative literature review followed by three empirical investigations: an interview study, a case survey and three in-depth case studies. Due to the explorative nature of the research, a mixed methods approach was taken

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(Creswell, 2009) involving three types of studies as described in Table I. The motivation of a mixed methods approach is in line with the explanation of methodological eclecticism by Teddlie and Tashakkori (2011, p. 286) as the selection and integration of the most appropriate techniques of qualitative and quantitative methods in order to more thoroughly investigate a phenomenon of interest. In this approach, the analysis of one research study evolves into the data collection of the coming.

3.1 Research framework

A number of relevant articles focusing on LSPs and/or environmental challenges in SCs were initially reviewed. The framework by Abbasi and Nilsson (2012), addressing current themes and challenges in making SCs environmentally sustainable, was deemed applicable to designing the empirical investigation. The framework consists of five categories of challenges: costs, complexity, operationalisation, mindset and cultural changes and uncertainties. These five categories made up the framework for structuring and analysing the interview study. Subcategories for each of the categories were generated, and questions formulated in order to explore the LSPs' perspectives on the sustainability challenges they face.

3.2 Interview study

A sample number of 30 LSP companies (including 3PLs, various transport operators and mid-sized hauliers) operating in the Scandinavian markets were identified and contacted for interviews. In total, ten companies agreed to participate (Table II). The interviews were divided

Phase/study	Purpose	Data
Phase 1/ interview study	To identify contemporary sustainability issues on how managers of LSPs and hauliers work with sustainable development	10 interviews (specified in Table II) focusing sustainable development in LSP companies
Phase 2/Case survey	To understand state-of-the-art of sustainable logistics services and explore how the LSPs strive to influence their subcontractors to be more sustainable in terms of transport emissions	20 questionnaire-based cases with specific details about environmental competence and subcontracting
Phase 3/Case study	To explore and gain in-depth understanding how LSPs in practice meet customer requirements and monitor subcontractors	3 in-depth case studies

Table I. The empirical studies performed in this research based on a mixed method approach

LSP actor (size and transport mode)	Position of the interviewee	Interview number
Medium, with rail and road as main modes of transport	Regional managing director	I1
Medium, with road as main mode of transport	Regional managing director	I2
Large, covering all modes of transport	Regional manager	I3
Large, with sea as main mode of transport	Sustainability manager	I4
Large, with air as main mode of transport	Environmental manager	I5
Large, with rail and road as main modes of transport	Environmental/quality manager	I6
Medium, with road as main mode of transport	Managing director	I7
Large, with road and rail (minor) as main modes of transport	Environmental/quality manager	I8
Medium, with road as main mode of transport	Managing director	I9
Medium, with road as main mode of transport	Environmental manager	I10

Note: LSP companies with 100-500 employees were classified as medium

Table II. The experts included in the interview study

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into two parts: the first part with open-ended questions asking about current and future activities related to environmental issues and organisational challenges. The second part consisted of interview questions based on the challenges presented by Abbasi and Nilsson (2012). The interviews were recorded and then transcribed for analysis. The analysis was carried out in two main steps, open and selective coding, to identify common themes and their connection to the research framework leading to the emergence of LSP-specific categories in relation to the five main categories. The results provided insights into the LSP perspectives of SC challenges and the general difficulties in dealing with sustainable development.

3.3 Case survey

The data for the case survey were generated from information gathered for a European sustainability award in the road freight business. This yearly award has been in existence since 2008 and requires (amongst other things) a standardised questionnaire to be filled in by the candidate logistics companies (LSPs or shipping/transport departments of retailer companies). Data were selected from the years 2012-2014, since in the first years of the award, no data regarding subcontractors or the relationship to them were recorded. A detailed overview of the case survey is listed in the Appendix.

In addition to basic details on company size (home country, scope of activities, turnover, number of employees, shipments, volume and fleet size), the questionnaire recorded the level of maturity of environmental activities with regard to greenhouse gas emissions (CO_2 accounting, CO_2 measurement, CO_2 management, environmental sustainability reporting), and the characteristics of the relationship to subcontractors. The candidates were asked, in particular, if they passed environmental sustainability requirements on to their subcontractors and if so, how, and what kind of requirements? The requirements also encompassed the capability of CO_2 accounting, measurement and management.

Overall, we analysed 20 questionnaires from five large, nine medium-sized and six small LSPs. Since the award is mainly driven by German institutions, the majority of companies were based in Germany (14) or German-speaking Switzerland (two). However, since the European sustainability award is made on a European scale, there were also four non-German-speaking applicants from Slovenia (one), Slovakia (one) and Italy (two) (see Table III for a condensed overview, details are presented in the Appendix).

The case survey data set was based on sustainability award candidates who responded voluntarily with high self-motivation and conviction regarding environmental sustainability. The fact that the case data sample was based on an evidently positive self-selection of highly sustainable logistics companies (at least in their self-perception) obviously biased our findings. The expectation was that the survey data would reveal a high level of environmental sustainability in the candidate companies in terms of greenhouse gas emissions and of passing sustainability requirements on to their subcontractors.

3.4 In-depth case study

To explore and gain in-depth understanding how LSPs in practice meet customer requirements and monitor subcontractors, a case study with three in-depth cases was carried out. The case study design was chosen because it focuses on understanding the dynamics present in single settings (Eisenhardt, 1989; Ellram, 1996) and to gain deeper insights into the phenomena being studied. The case study approach was used to illustrate the interdependency and complexity of organisationally nested planning and control structures in SC transport.

The three cases were selected from the interview study companies. They involved two of the major LSPs operating pan-European networks and with a strong presence in the Scandinavian markets, and one medium-sized LSP operating in the Nordic market. All were selected for their public environmental profiles and marketed environment programs,

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Table III.
Findings case survey – condensed overview (see Appendix for case details)

Case No.	Company size	Home base/ country	Importance of subcontractor relation (road)	Sustainability competence of LSP	Sustainability requirements by customers to LSP	Intercompany control of carbon emissions	Comment
1	Big	Germany	Low	High	Yes, also CO_2 emissions	No	Low importance of subs
2	Medium	Germany	Low	Medium	Yes, also CO_2 emissions	No	Low importance of subs
3	Medium	Italy	High	Medium	Yes, general CSR information	No	Unclear customer requirements on carbon data
4	Small	Italy	Low	Medium	No	No	Low customer pressure and low importance of subs
5	Medium	Germany	Low	Medium	Yes, no CO_2 emissions by 2040	No	Low importance of subs
6	Small	Slovakia	None	Low	Yes, also CO_2 emissions	No (no subs used)	–
7	Big	Germany	High	High	Yes, also with regard to CO_2 emissions	Yes	Consistent profile
8	Big	Switzerland	High	Medium	Yes, CO_2 emissions	No	Inconsistent profile
9	Medium	Germany	Low	Medium	Yes, CO_2 emissions	No	Low importance of subs
10	Big	Germany	High	Low	Yes, CO_2 emissions	No	Inconsistent profile
11	Medium	Germany	High	Low	Yes, CO_2 emissions	No	Inconsistent profile
12	Small	Slovenia	None	Low	ns	No (no subs used)	–
13	Medium	Switzerland	Medium	Low	Yes, fuel consumption and fleet age	No	Inconsistent profile
14	Medium	Germany	Medium	Low	Yes, CO_2 emissions	Yes	Consistent profile, but limited intercompany use of carbon data
15	Medium	Germany	Medium	Low	Yes, environmental balance sheet	No	Unclear customer requirements on carbon data
16	Small	Germany	Medium	Low	Yes, environmental management system and fleet requirements	No	Unclear customer requirements on carbon data
17	Big	Germany	Low	Medium	Yes, also CO_2 emissions	No	Low importance of subs
18	Medium	Germany	High	Medium	Yes, but not CO_2 emissions	No	Inconsistent profile
19	Small	Germany	Low	Low	Yes, CO_2 emissions	No	Low importance of subs
20	Small	Germany	None	Low	Yes, CO_2 emissions	No (no subs used)	–

Note: ns, not specified

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accessibility and their interest in the research area. Data were gathered from the cases based on open interviews, sustainability reports, websites and internal documentation of the number, set-up and type of subcontractors involved. A convenience selection of the subcontracted hauliers of the LSPs was interviewed to study follow-up procedures which particularly focused on the environmentally relevant aspects of their operations. Two of the world's ten largest logistics companies are represented in the in-depth case study:

- Case A began at the LSP where interviewee I3 was employed (LSP A). Three complementary short interviews with follow-up questions were conducted with two environmental managers of the same company, one on the European level and one on the Scandinavian level, and with one account manager on the international level. To investigate the effects in practice, the haulier represented by interviewee I7, subcontracted by LSP A, was mainly studied.
- Case B consisted of LSP B (the company of I8) and an interest organisation representing the LSP's Scandinavian subcontractors. The LSP and its subcontractors have an open attitude to research involvement, so extensive additional data and interview material from previous research studies were available for comparison.
- Case C focused on one of the LSPs who took part in the survey and explored the development of environmental logistics concepts which provided their customers with both lower CO_2 impacts and lower costs.

3.5 Reliability and validity

To gain reliability of the research, a number of measures have been taken (Yin, 2003). The interviews followed the framework of Abbasi and Nilsson (2012), and were transcribed, coded and synthesised by two researchers. For the case survey, it is a public, annual activity based on positive self-selection. According to several researchers, it is highly likely to reveal similar results in other geographic regions. The in-depth case studies used the LSPs' existing templates and reports for monitoring and follow-up of transport activities as the most central data.

External validity of the study was facilitated through a cross-European sample of involved companies/interviewees from Germany, Denmark, Sweden, Norway, Switzerland, Slovakia and Italy. The process of investigating the monitoring of environmental sustainability by going through interviews, to case survey, and from case survey to actual monitoring in LSPs' procedures, represents a logical chain of investigation. Multiple sources of evidence contribute to construct validity as does the process of the three authors sharing data collection, analysis and writing.

4. Findings

4.1 Interview study findings

The following sections present the findings from the interview study based on the framework by Abbasi and Nilsson (2012): costs, complexity, operationalisation, mindset and cultural changes and uncertainties.

4.1.1 Costs. The fact that it must be financially beneficial to be green is something most respondents find important. Only one interviewee (I2) had a different view, recognising that the challenge of becoming sustainable must be prioritised and that the benefits to the company are indirect and long term. All the interviewees argued, more or less explicitly, that unsustainable transport is too inexpensive and that the aspects their customers primarily prioritise are cost and time. Yet, most of the interviewees agree on the difficulties in quantifying the environmental costs of logistical operations/activities and processes.

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Some of the interviewees argued that sustainability-prioritised logistical solutions can cost less (I1, I2 and I4) or the same (I3, I9 and I10) in the long term and if the costs are shared among the SC stakeholders. The rest of the interviewees stated that even though every solution might not trigger costs, it is costly to, for example, develop new clean technologies, vehicles and fuels, since the LSPs must sign long-term contracts with the subcontracted hauliers in order for them to carry out such investments into their fleets.

4.1.2 Complexity. CO_2 emissions represented the environmental effect which was most elaborated on concerning the complexity involved in sustainable development. Just as LSPs have different perceptions of the difficulties in diagnosing environmental effects, they also report different degrees of difficulty in measuring and assessing the environmental effects (e.g. CO_2 emissions) of logistical operations and processes.

Some of the interviewees shed light on CSR and highlighted some of its aspects like education, training, safety and customer satisfaction, "We are not the direct employer of the drivers […] but of course we have to take responsibility for road accidents involving lorries that have our logotype […] We communicate this to our hauliers. We also have training modules for drivers and interactive programmes for hauliers that they can access on the internet. We have, of course, direct communication with our hauliers as well" (I8).

Almost all the interviewees put forward the issues related to sustainable development. I1 refers to carbon leakage from transport involving electric vehicles and production of electricity. I6 explains that exports, which enable increases in GDP, may increase the demand for logistical services, transport intensity (tonne-km) and traffic intensity (vehicle-km), and as a result lead to higher environmental degradation. I8 elaborates on the dilemma concerning decreasing fill rates/resources utilisation, higher service levels and environmental degradation by stating: "There is a dilemma when it comes to 'customer service'! We would like to offer daily departures for our customers but then we would have a lower degree of utilisation […] so, we have to find out what is acceptable for the customers and at the same time increase the fill rate […] And I think that our industry or line of business is a little guilty as we have been competing with daily departures and perhaps the transport buyers may not need these services […]".

4.1.3 Operationalisation. One challenge raised concerning the operationalisation of sustainable development was the difficulty in interpreting and integrating economic, social and environmental sustainability. Similarly, the majority of the interviewees experience difficulties in interpreting and implementing sustainable development in the context of logistics. I7 highlights the operationalisation challenges with its subcontractors: "I usually say that we made a journey together with our hauliers […]. Nowadays, we also have environmental demands which they have to fulfil in order to qualify as a subcontractor or haulier for us".

Challenges raised in the literature were organisational inertia and resistance to change in developing environmentally sustainable operations (Abbasi and Nilsson, 2012). These challenges are less often mentioned by the LSPs interviewed (five interviewees regard inertia as low and only three as high). However, some issues emerged in discussion. I8, for example, perceives high inertia due to the conservativeness of the owners of the company and their fear of change, and I3 reflects on the fact that there is less inertia among younger colleagues than older ones.

4.1.4 Mindset and cultural changes. To change mindset and culture calls for awareness about sustainable development. Just as LSPs have major difficulties in operationalisation of sustainable development, they have similar difficulties in making their customers aware of what sustainability development means and the dimensions it has: "We have customers of all sizes […] the bigger ones are well aware and to some extent even push us. However, the majority are not well aware or at least not willing to change their buying patterns" (I8).

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Although it is fairly difficult to increase customers' sustainability awareness, it is even more difficult to change their behaviour according to the interviewees. I6 states "They are very good at placing demands on us. And they tell us what they think we should do although they do not do it themselves. They put pressure just on us". As raised several times during the interviews, time and cost are prioritised by customers and when more sustainable alternatives are presented that either cost slightly more or are less time-accurate, these alternatives are often discarded in the process of logistics service procurement.

The interviewees had different perceptions when it came to increasing sustainability awareness and changing the behaviour of decision makers and organisational co-workers. This was as difficult and challenging as other changes in their organisations, but it was regarded as being more of a normal management challenge than specific to sustainability.

4.1.5 Uncertainties. The LSPs interviewed are unaware of, and uncertain about, future regulations, policies and legislation formulated by governments and policy makers. They are also very uncertain about sustainability-related strategies formulated by SC stakeholders as well as customers' behaviour and future possible demands.

4.2 Case survey findings

From all the 20 surveyed cases, only two show the pattern of LSPs passing customer requirements on to its subcontractors (see Table III and Appendix for details):

- Case 7 has a consistent profile regarding carbon emission management and subcontractor relations. Driven by customer requirements, the company perceives itself as having a rather high level of competency in sustainability issues and carbon accounting and control. The company is heavily dependent on subcontractors and consequently passes these requirements on to its broad subcontractor base. However, the company behind case 7 is a major, world-leading LSP, which is currently dealing with the challenge of assisting its subcontractors in developing more sustainable operations.
- In case 14, the LSP states that it also passes on the customer's requirements to its subcontractors. But the LSP itself does not appear to have a high level of competency in the fields of sustainability and carbon accounting and control. It seems that the LSP only passes the requirements on, but the data delivered by subcontractors are not really used for the calculation of Scope 3 emissions. Hence, the intercompany use of the carbon emission data is clearly limited.

In three of the 20 cases, no subcontractors are used (Cases 6, 12 and 20). Thus, the task of passing on CO_2-emission control to subcontractors plays a minor role. All three companies are fairly small and do not subcontract any transport activities. Two of them (Cases 6 and 20) have to deal with the carbon control requirements of their customers and therefore internally have to deal with the accounting and control of CO_2 emissions. Case 12 provides no further specifications of customer requirements. Due to the limited explanatory power of these three cases, they were excluded from further analysis. However, reflecting on the context of the sustainability award, it was interesting to see that these companies must have viewed themselves as somewhat advanced sustainable logistics companies.

In 15 of the 20 cases, LSPs do care about their own internal (Scope 1) carbon emissions in some way, but do not pass this concern on as a requirement to their subcontractors. This is presumably done for several reasons:

- Case 1: the role of subcontractors seems to be of minor importance for the operative business. This is reflected by the <1 per cent volume/shipments operated by subcontractors.

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- Case 4: since customers do not require carbon emissions accounting, this LSP seems to neglect to pass this topic on to its subcontractors, which accounts for approximately 16 per cent of the number of shipments and 14 per cent of the volume. The LSP seems to work after the guiding principle "no customer pressure, no action".
- Cases 3, 15 and 16: here the customers indirectly require rather general sustainability measures like CSR information (Case 3), environmental balance sheet (Case 15) or environmental management systems and fleet requirements (Case 16). Delivering data on carbon emissions could be part of these general requirements, but this was not further specified in the survey data. However, in none of these cases does an LSP require any carbon emission data from their subcontractors (see entries in Table III column 8 "unclear customer requirements on carbon data").
- Cases 1, 2, 5, 8-11, 13, 17 and 19: these ten cases (i.e. 50 per cent of our whole case survey) report direct requirements from customers to their LSPs regarding CO_2 emissions. However, these requirements are not passed on to subcontractors (see entries in Table III column 6 regarding "CO2 emissions" or "fuel consumption").

In Cases 1, 2, 4, 5, 9, 17 and 19 the companies report that subcontractors are of rather low importance for day-to-day transport operations (below 20 per cent of shipments/volume). Again, their minor importance for the operative business could be one driver not to pass on customers' carbon emissions requirements (see entries in Table III column 8 "low importance of subs").

On the other hand, Cases 8, 10, 11, 13 and 18 show LSPs with a minimum of 25 per cent and up to 100 per cent of shipments/volume operated by subcontractors. Here, the relevance of subcontractors' emissions is of higher importance, but LSPs do not pass on customer requirements to their transport supplier base. The reasons for this remain unclear and cannot be drawn out/elicited from the case survey questionnaire data (see entries in Table III column 8 "inconsistent profile").

The case survey analysis substantiates the general perception in practice that passing on customer requirements regarding CO_2 emissions from LSPs to their subcontractors is not yet common practice in the logistics and road transport business. It must be pointed out that this result is not statistically validated, since the overall data set is too small. However, the positive self-selection of the award participants results in a sample of companies which evaluate themselves as being highly confident about their sustainability and carbon management issues. With this in mind, the low share of companies dealing with carbon emissions on an intercompany level is rather surprising and represents a fair and presumably valid reflection about the current practice of the real world.

4.3 Case study

4.3.1 Case study findings. The research framework and interview study revealed, among other things, that two main themes – customer attention and the fragmented industry (large LSPs and small hauliers) – are challenging for sustainable development. The case survey highlighted the low level of monitoring in practice of subcontractors, which may indicate that customer requirements are not really prioritised.

The large LSPs rarely own or govern any lorries but instead purchase transport and other logistics services from hauliers (Stefansson, 2006; Sternberg *et al.*, 2013). One of the LSPs interviewed was in the process of selling off its proprietary fleet (150 lorries) in order to be more flexible and competitive. Some of the hauliers report that the requirements from LSPs have increased in terms of quality certificates (e.g. ISO 14001) and follow-up questionnaires. Consequently, the three case studies explore how the environmental policies of large LSPs are applied in practice, and how these companies are working with their subcontracted transport suppliers.

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4.3.2 Case A. Case A consists of a large LSP (I3's company in the interview study) and one of their thousands of subcontractors, a haulier (I7 in the interview study). I7's lorries are profiled with I3's logo and colours. Manager I3 states: "We work really hard with measurements and calculations", and "We are well ahead in the holistic perspective". To a great extent the LSP assists it customers in setting up various environmental performance measurement processes, such as CO_2 reporting. The claims from the LSP were followed up with I7 (Tables III and IV).

I7 told the authors about when the LSP called the haulier and wanted them to purchase environmentally friendly vehicles. Currently, the haulier mostly uses Euro3 lorries (an old Euro standard for truck engines) and I7 stated: "They tell us to drive environmentally friendly vehicles, but in the end, all they really care about is the lowest price". The LSP generally pays its subcontracted hauliers a fixed price based on either the line operated or the actual distance/weight of an assignment.

An additional interviewee (sales manager) of the LSP was contacted. When asked about how the environmental programme of the LSP is carried out, he explained: "Our environmental programme is very ambitious, but the main goal is for it to be selling. When the goods are moved by our subcontractors, we actually don't know how they do it".

4.3.3 Case B. Case B consists of the LSP B (I8's company in the interview study). The majority of the trucks belonging to the subcontracted hauliers are painted with the logo and colours of the LSP (I8): "They are not our lorries, but they are painted with our logotype and we have to take responsibility". When asked about whether it should be financially beneficial to be green, I8 commented: "If you look at individual/small haulage companies, it is not fair that they should be the ones to carry the burden […]".

"We do work together on most questions and share most of the objectives for the future", stated one of the managers of the interest organisation. The annual follow-up survey the LSP and the association of LSP B's subcontracted hauliers carry out jointly contains questions on driver training (e.g. details on the percentage of drivers with eco-driving or dangerous goods training), driver social conditions (e.g. union agreements and contracts) and lorry specifications (e.g. engine types).

An additional interviewee from the LSP, working with environmental calculations, explained: "Sometimes we just use standard aggregate values, but whenever possible we use the audits on the fleets from the subcontractors involved in moving a particular customer's goods […] The methods we use could hardly be called scientific, but at least we try. In tenders, customers sometimes ask us to turn in information on the expected environmental impact and we calculate it based on the local subcontractors' fleets, but we have no clue as to how our competitors calculate".

This LSP mainly operates based on revenue-sharing contracts with most of its subcontracted hauliers. Given the high level of commitment and in-depth collaboration with its subcontractors, we asked a marketing manager of the same LSP for his opinion about

Table IV.
Case A: summarising perspectives on environmental policy and follow-up

	LSP	Subcontracted haulier
Environmental policy	Runs an extensive environmental programme and has an ambitious CSR policy	No environmental policy
Reporting	Produces detailed environmental reports for customers. Supervises environmental reporting	Produces pro forma reports for the LSP, sometimes under supervision from the LSP
Sample environmental activities	Central organisation pushing sustainable vehicles (e.g. gas-fuelled lorries) to subcontractors	No activities dedicated to the environment

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offering logistics services with a relatively high level of environmental and social responsibility, compared to that of competitors. He answered: "We are increasingly facing difficulties in competing; in the south of Sweden we are unable to sell any full truck loads, because the customers are not prepared to pay for our accountable service". Table V summarises the perspective in Case B.

4.3.4 Case C. The third case (the company of I1) is based on previous joint research studies along with follow-up studies of actual outcomes and reflections. Being an LSP focused on environmental solutions, one of the central services provided for their customers is the co-ordination of deliveries to stores by intermodal transport (freight train and last-mile lorry service). The goods being handled are mainly fast-moving consumer goods sold in retail stores where the LSP focus is on delivery operations: the pickup, loading, distribution, unloading and return flow of products in the Swedish and/or Nordic region. Based on advanced planning and visualisation tools, the company developed different alternatives for its customers which explicitly provide environmentally friendly alternatives together with competitive time, quality and cost set-ups.

One of their major customers, which the LSP (I1) had served for several years, was in the process of procuring logistics services for the coming three-year period. In the request, the environmental aspects were highlighted as very important. The LSP responded with different solutions, all incorporating environmental priorities.

Table VI illustrates one of the suggestions, combining train and lorry, where the LSP co-ordinates deliveries with other customers in one region in Sweden: instead of having deliveries on Mondays, Tuesdays and Wednesdays (M, T, W), it delivers on Mondays, Wednesdays and Thursdays (M, W, T). The trade-offs are that the deliveries cannot offer the same precise estimated delivery time as before, and involve costlier administration (planning, billing, registering, etc.). The suggested solution lowers transport distance by 31 per cent in the delivery stage and also the environmental impact in terms of CO_2. Including the first stage transport by train, the total solution demonstrated even greater reduction of CO_2 compared to road transport all the way. Due to the fact that fewer lorries are needed (i.e. improved fill rates), the areas where the stores are located have in total fewer lorries driving around, which also is beneficial in terms of less traffic in the area.

	LSP	Subcontracted haulier
Environmental policy	Runs an environmental programme and has an ambitious CSR policy	Obliged to apply the environmental policy of the LSP
Reporting	Produces detailed environmental reports for customers. Supervises environmental reporting	Produces detailed reports for the LSP, actively monitored and supervised by the hauliers' interest organisation
Sample environmental activities	Training programmes for subcontracted hauliers	Activities are agreed on between the LSP and the interest organisation

Table V.
Case B: summarising perspectives on environmental policy and follow-up between LSP and subcontracted haulier

	Current set-up (deliveries M, T, W)	Suggested set-up (deliveries M, W, T)
Deliveries (No.)	56	56
Pallets (No.)	120	120
Lorry delivery distance (km)	9,558	6,599
Lorries needed (No.)	40	24

Table VI.
Case C: summary of current and a suggested delivery set-up presented to the LSP customer

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Nonetheless, the customer decided to procure the logistics services from another LSP who only used road transport solutions, with the explanation that the competitor was both less costly and provided higher precision in delivery times. Consequently, while the importance of environmental solutions was raised, at the end of the day it was all about cost and time. Or, as the manager at the LSP company expressed it: "Customer behaviours today are the opposite of what is needed" in order to reach the targets set for CO_2 reductions. He continued by arguing that: "It is not the more environmentally friendly solutions, but the less environmentally friendly solutions that should cost the most".

4.3.5 Synthesis. Having policies is one thing, acting on them is another. The interview study and the three case studies confirmed that, from an LSP perspective, a majority of buyers of logistics services focus on service quality and price – not on environmental sustainability. Furthermore, as found in the case survey, there are seldom systematic follow-ups related to emissions from subcontractors by LSPs. Consequently, the incentives to really improve and contribute to lowering carbon emissions are easily prioritised as less important than business-related aspects, such as costs and deliver accuracy.

The case studies revealed a great difference between how two LSPs (Case A and Case B), with similar CSR and environmental policies, enforce and monitor their subcontractors. This difference in actual practice may bring into question the validity of environmental reports. As shown in the literature, the fragmented industry means that many hauliers are subcontractors to other hauliers. We found no evidence that what are called "sub-hauliers" are involved in the environmental monitoring of LSPs, as illustrated in Figure 1.

As highlighted in Case C, one major reason for the lack of actual monitoring and follow-up of the environmental performance of hauliers and other subcontractors by LSPs is

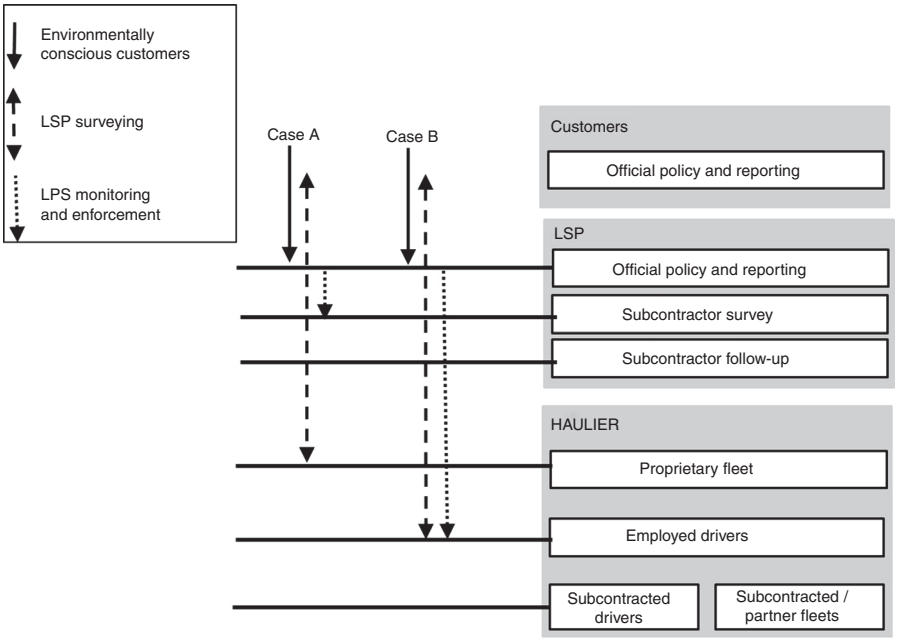

Figure 1.
An illustration of the difference between LSP policy and practice

Note: Some customers do not consider the environment, as in Case C, which means they are not depicted in the figure

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the lack of real interest and demand from customers. As one representative from the LSP in Case B expressed it: "I have never experienced a customer asking for any environmental reports in the procurement process […]".

5. Concluding discussion

Overall, it can be concluded that the issues of sustainability are complex, involve a great deal of uncertainty and are challenging to operationalise; all of which are also raised and discussed in the relevant literature. This complex picture is also in line with the results of research by Dubey *et al.* (2017) on drivers for sustainable SCs that "institutional pressures and ethics and values of the society influence the competitiveness of any firm […]. Focus on green technologies, product design, warehousing and logistics further helps the firm to improve the green brand image and brand equity, which in turn will help to improve customer demand and cost savings […]". As a result, several steps are needed for any action to happen, especially in the lower tiers of SCs (Tachizawa and Wong, 2014). This complexity may also be a reason for the absence of meaningful environmental monitoring of subcontractors and LSPs in general. However, for the specific context of logistics services, there are some interesting aspects which need further exploration. One is how problematic the current business models are, where social and environmental sustainability are sacrificed for short-term financial sustainability, especially due to the customer's single focus on time and cost when selecting logistics service suppliers. As concluded by Large *et al.* (2013, p. 130), "purchasing companies influence logistics service providers to a minor extent regarding ecologically and socially sustainable actions". Consequently, the hunt for ever less costly/ever cheaper activities coupled with very low margins in the industry leads to operational quick fix solutions rather than strategic direction and innovations which, in the long term can lead to sustainable development. For subcontractors in lower tiers, often small or medium-sized hauliers, resources are scarce, and as found by Lun *et al.* (2015), "it may be difficult for small firms to develop greening capability to meet the increasing market requirements". As reported in literature (Oke, 2007; Wagner, 2008), innovation focus and the number of innovators are low in the logistics industry. In addition, when innovation activities are carried out by LSPs, the focus is most often on proactive cost improvement and proactive performance improvement in order to generate customer loyalty (Wallenburg, 2009). The dominating cost and efficiency focus has led to an earning-without-paying perspective in more than half of the LSPs interviewed. From this perspective, it is acceptable to make a profit without paying attention to environmental degradation or social vulnerability, or without making any financial efforts to reduce them. Consequently, one of the industries with the greatest environmental impact is under cost and efficiency pressure from its customers at the same time as the level of innovation is low. As a result, as already concluded by Wu and Dunn (1994, p. 34): "Logistics has been a missing link in providing green products and services to the consumer". Logistics seems still to be the missing link and a non-prioritised area in SCs.

5.1 Managerial and policy implications

The fragmentation of the logistics industry today makes co-ordination and overall development difficult, at the same time as the major drivers for most LSPs have been to deliver less costly alternatives and more accurate deliveries at the expense of their own long-term development. In this paper, we have illustrated the complexity involved when large LSPs try to monitor hundreds of domestic suppliers. The majority of the activities in physical transport are not carried out by the LSPs themselves, but by subcontractors. SC managers looking for sustainable or "green" logistics services need to look further than LSP reports (Piecyk and Björklund, 2015) in order to ensure the degree of environmental sustainability promised by LSPs, and they also need to scrutinise how LSPs are performing follow-ups of their subcontracted hauliers. For policy makers, we highlight that any real

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interest in environmental sustainable logistics solutions from customers of logistics services is not yet a reality. If the goals and changes set by, for example the EU, should be viable, policy makers need to create more "polluter pays"-schemes to address the current situation where it is possible to make a profit without paying attention to environmental degradation or social vulnerability, or without making any financial efforts to reduce them.

5.2 Future research

While this research has investigated how environmental policies are put into practice in a fragmented industry (Sternberg *et al.*, 2013), we have not addressed the social aspects of the LSPs' CSR policies. Considering the fragmentation in the industry and the low transparency and follow-up of environmental policies (Piecyk and Björklund, 2015), social sustainability in the transport industry may show similar characteristics. This research uses interviews, case studies and a survey, but in order to further generalise the findings, future surveys should involve more subcontractors and/or a larger geographical scope.

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Appendix

Case No.	1	2	3	4	5
Category of comp size	Big	Medium	Medium	Small	Medium
Home base/country	Germany	Germany	Italy	Italy	Germany
Geographical spread of locations	Germany/Switzerland	Germany	Italy	Italy/Bulgaria	Germany
Size of LSP					
No. of locations	25	1	4	3	10
No. of own freight vehicles	20	250	5	15	365
No. of employees	800	400	25	30	850
Turnover volume in mil EUR	> 100 < 1,000	> 30 < 100	> 30 < 100	< 5	> 30 < 100
% road	34	96	ns	100	65
Operations					
No. of sendings	1,300,000	112,000	23,000	5,000	640,000
% road	14	100	61	100	92
Transport volume in K tons	26,000	ns	230	120	1,800
% road	14	100	17	100	92
Sub-service providers					
No. of subs	> 100 (majority not road)	< 50	< 100	< 10	< 50
% of sendings by subs	< 1	18	99	16	12
% of volume by subs	< 1	ns	99	14	12
Importance of subcontractor relation for own operations (road)	Low	Low	High	Low	Low
Sustainability and carbon competence of LSP					
Sustainability report	Yes – every two years	No	No	No	Yes – every year
CO_2 reduction target	10% reduction by 2020 based on 2012	4% reduction by mid-2016 based on mid-2013	No	25% within the next 10 years	ns
Measurement of own emissions (Scope 1)	Yes	Yes	Yes	Yes	Yes
Measurement of Scope 2 emissions	Yes	No	No	ns	ns
Measurement of subs emissions (Scope 3)	Yes (calculation)	No	Yes (calculation)	ns	Yes (calculation)
Sustainability relation LSP-customer/LSP-subs					
No. of customers requiring CO_2 reports	10	1	0	0	ns
Sustainability requirements by customers to LSP	Few customers, also with regard to CO_2 emissions	Few customers, also with regard to CO_2 emissions	Few customers want general CSR information	No	Yes, no CO_2 emissions by 2040

(*continued*)

Table AI.
Case survey overview – part I (cases 1-5)

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Case No.	1	2	3	4	5
Sustainability requirements by LSP to subs	Yes, but not with regard to CO_2 emissions, due to minor role of subs in road transport	Yes, but not with regard to CO_2 emissions	No	Yes, but not with regard to CO_2 emissions	ns – seems to play no role!
Overall evaluation of single cases with regard to intercompany control of carbon emissions	CO_2-emission requirement not passed on to subs, but seems to be of low importance because of $<1\%$ volume/ sendings handled by subs	CO_2-emission requirement not passed on to subs	CO_2-emission requirement not passed on to subs. Low pressure by customers	CO_2-emission requirement not passed on to subs. Low pressure by customers	CO_2-emission requirement not passed on to subs, though customers set certain pressure

Note: ns, not specified

Table AI.

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Case No.	6	7	8	9	10
Category of comp size	Small	Big	Big	Medium	Big
Home base/country	Slovakia	Germany	Switzerland	Germany	Germany
Geographical spread of locations	Germany/Slovakia	Worldwide	Switzerland/ France	Germany/ Czech Rep.	Germany
Size of LSP					
No of locations	ns	> 12,000	11	10	64
No of own freight vehicles	284	234,000	1	258	1,680
No of employees	380	480,000	140	470	4,000
Turnover volume in mil EUR	> 15 < 30	> 1,000	> 100 < 1,000	> 30 < 100	> 100 < 1,000
% road	100	20	100	98	80
Operations					
No of sendings	ns	20,300,000,000	15,900,000	140,000	320,000,000
% road	100	92	99.9	100	100
Transport volume in K tons	750	ns	80	1,000	4,700
% road	100	ns	100	100	100
Sub-service providers					
No. of subs	0	> 1,000	< 100	< 10	> 100
% of sendings by subs	0	80	100	10	90
% of volume by subs	0	ns	100	8	90
Importance of subcontractor relation for own operations (road)	None	High	High	Low	High
Sustainability and carbon competence of LSP					
Sustainability report	No	Yes – every year	No	Yes – every year	Yes – every two years
CO_2 reduction target	ns	Yes	ns	ns	ns
Measurement of own emissions (Scope 1)	Yes	Yes	Yes	Yes	Yes
Measurement of Scope 2 emissions	ns	Yes	ns	ns	ns
Measurement of subs emissions (Scope 3)	ns	Yes (calculation)	Yes (calculation)	Yes (calculation)	ns
Sustainability relation LSP-customer/LSP-subs					
No of customers requiring CO_2 reports	ns	Yes	ns	ns	ns
Sustainability requirements by customers to LSP	Yes, also with regard to CO_2 emissions	Yes, also with regard to CO_2 emissions	Yes, especially with regard to CO_2 emissions	Yes, especially with regard to CO_2 emissions	Yes, especially with regard to CO_2 emissions
Sustainability requirements by LSP to subs	No, not necessary, since no subs	Yes, also with regard to CO_2 emissions	Yes, but not with regard to CO_2 emissions	Yes, but not with regard to CO_2 emissions	Yes, but not with regard to CO_2 emissions
Overall evaluation of single cases with regard to intercompany control of carbon emissions	No subs used. Doing some CO_2 measurement internally. No sustainability reporting. Topic overall of low relevance	Requirements passed on to subs. However, global challenges in gathering real fuel consumption data	CO_2-emission requirement not passed on to subs, though customers set certain pressure	CO_2-emission requirement not passed on to subs, though customers set certain pressure	CO_2-emission requirement not passed on to subs, though customers set certain pressure

Note: ns, not specified

Table AII.
Case survey overview – part II (cases 6-10)

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Case No.	11	12	13	14	15
Category of comp size	Medium	Small	Medium	Medium	Medium
Home base/country	Germany	Slovenia	Switzerland	Germany	Germany
Geographical spread of locations	Germany	Slovenia	Switzerland/ Austria	Germany/Italy	Germany
Size of LSP					
No. of locations	1	1	18	6	2
No. of own freight vehicles	93	67	176	105	80
No. of employees	580	90	540	280	190
Turnover volume in mil EUR	> 30 < 100	> 5 < 15	> 30 < 100	> 30 < 100	> 30 < 100
% road	83	100	60	46	35
Operations					
No. of sendings	880,000	ns	395,000	130,000	145,000
% road	99	100	95	75	30
Transport volume in K tons	1,000	ns	750	840	670
% road	99	ns	95	48	25
Sub-service providers					
No. of subs	< 50	ns	< 100	> 1,000	< 100
% of sendings by subs	73	2	33	43	25
% of volume by subs	24	ns	36	44	25
Importance of subcontractor relation for own operations (road)	High	None	Medium	Medium	Medium
Sustainability and carbon competence of LSP					
Sustainability report	Yes – every year	No	Yes – every year	No	Yes – every year
CO_2 reduction target	ns	ns	ns	ns	ns
Measurement of own emissions (Scope 1)	Yes	No	Yes	Yes	Yes
Measurement of Scope 2 emissions	ns	ns	ns	ns	ns
Measurement of subs emissions (Scope 3)	ns	ns	ns	ns	ns
Sustainability relation LSP-customer/LSP-subs					
No of customers requiring CO_2 reports	ns	ns	ns	ns	ns
Sustainability requirements by customers to LSP	Yes, especially with regard to CO_2 emissions	ns	Yes, fuel consumption and fleet age	Yes, especially with regard to CO_2 emissions	Yes, especially with regard to an environmental balance sheet
Sustainability requirements by LSP to subs	Yes, but not with regard to CO_2 emissions	ns	Yes, but not with regard to CO_2 emissions	Yes, also with regard to CO_2 emissions	Yes, but not with regard to CO_2 emissions
Overall evaluation of single cases with regard to intercompany control of carbon emissions	CO_2-emission requirement not passed on to subs, though customers set certain pressure	Nearly no subs used	CO_2-emission requirement not passed on to subs, though customers set certain pressure	Requirements passed on to subs, but tentatively no big competence in CO_2 accounting and measurement	CO_2-emission requirement not passed on to subs, though customers set certain pressure

Table AIII.
Case survey overview – part III (cases 11-15)

Note: ns, not specified

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Case No.	16	17	18	19	20
Category of comp size	Small	Big	Medium	Small	Small
Home base/ country	Germany	Germany	Germany	Germany	Germany
Geographical spread of locations	Germany	Worldwide	Germany/Poland	Germany	Germany
Size of LSP					
No. of locations	2	204	23	1	3
No. of own freight vehicles	103	111	103	81	41
No. of employees	150	3,000 (GER)	700	100	70
Turnover volume in mil EUR	> 15 < 30	> 1,000	> 30 < 100	> 15 < 30	< 5
% road	90	27	67	99	75
Operations					
No of sendings	94,000	15,200,000	196,000	14,000	13,000
% road	100	91	100	100	100
Transport volume in K tons	1,000	12,100	3,500	350	210
% road	100	43	100	100	100
Sub-service providers					
No of subs	< 10	ns	ns	< 5	0
% of sendings by subs	30	ns	72	8	0
% of volume by subs	ns	ns	57	8	0
Importance of subcontractor relation for own operations (road)	Medium	Low	High	Low	None
Sustainability and carbon competence of LSP					
Sustainability report	No	Yes – every year	No	No	Yes – every year
CO_2 reduction target	ns	Yes, but not specified in survey	Yes, but not specified in survey	ns	ns
Measurement of own emissions (Scope 1)	Yes	Yes	Yes	Yes (calculation)	ns
Measurement of Scope 2 emissions	ns	ns	ns	ns	ns
Measurement of subs emissions (Scope 3)	ns	No	No	No	No, not necessary, since no subs
Sustainability relation LSP-customer/LSP-subs					
No. of customers requiring CO_2 reports	ns	ns	ns	ns	ns

(*continued*)

Table AIV.
Case survey overview – part IV (cases 15-20)

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Case No.	16	17	18	19	20
Sustainability requirements by customers to LSP	Yes, especially with regard to environmental management system and fleet requirements	Yes, also with regard to CO_2 emissions	Yes, but not with regard to CO_2 emissions	Yes, especially with regard to CO_2 emissions	Yes, especially with regard to CO_2 emissions
Sustainability requirements by LSP to subs	Yes, but not with regard to CO_2 emissions	Yes, but not with regard to CO_2 emissions	Yes, but not with regard to CO_2 emissions	Yes, but not with regard to CO_2 emissions	No, not necessary, since no subs
Overall evaluation of single cases with regard to intercompany control of carbon emissions	CO_2-emission requirement not passed on to subs, though customers set certain pressure	CO_2-emission requirement not passed on to subs, though customers set certain pressure	CO_2-emission requirement not passed on to subs, though customers set certain pressure	CO_2-rmission requirement not passed on to subs, though customers set certain pressure	No subs used

Table AIV.

Note: ns, not specified

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