THESIS FOR THE DEGREE OF LICENTIATE OF ENGINEERING

Management of the procurement of transport services to reduce CO_2 emissions

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Abstract

It is important for shippers to purposefully manage the procurement of transport services internally (inward) and in relation to their transport providers and customers (outward) to reduce CO_2 emissions. Further, contextual factors' influence on the procurement of transport services needs to be understood to reduce CO_2 emissions. Previous research suggests that shippers face challenges in realising their climate commitment in the procurement of transport services when it comes to both inward and outward settings. This licentiate thesis sets out to explore how such climate commitment can be realised.

This thesis is a compilation of three papers based on a survey study and a case study in Sweden. The findings indicate that the realisation of the climate commitment in the procurement of transport services implies that the transport procurement is managed to ensure alignment on climate performance with transport providers and customers. Outward managerial practices include the specification of climate-related criteria for transport providers and consolidating deliveries to customers. It was also found that the realisation of the climate commitment implies that the transport performance metrics are adapted to the climate commitment. The findings of this thesis highlights the importance of inward managerial practices which are centred around selecting and maintaining transport performance metrics in a way that the climate performance is balanced against other transport performance goals such as transport time and time precision. Further, it was noted that shippers adapt the degree to which they specify transport-related criteria (e.g., transport time and time precision) to the context in which they operate; that can have moderating effects on the realisation of the climate commitment.

Keywords: Transport procurement, Transport performance, Shipper, Transport provider, CO_2 emissions, Climate, Logistics

List of papers

Paper I
Ghanei, J., Andersson, D., Styhre, L. (2023), 'Importance of context when specifying transport services'.

Submitted to an international journal.

The earlier version of this paper entitled 'Contextual considerations when specifying transport services to reduce CO_2 emissions' was peer-reviewed and presented at the 30th Annual IPSERA conference, 29th March - 1st April 2021 (online)

The first author was responsible for the frame of reference and data analysis. The survey design and data collection were shared between the second and the third author. The writing was shared among the authors.

Paper II
Ghanei, J. (2023), 'What does it take to reduce CO_2 emissions in a multiple-goal transport performance system?'.

Submitted to an international journal.

The earlier version of this paper entitled 'Utilisation of CO_2 emissions data from purchased transport services' was peer-reviewed and presented at the 31st Annual IPSERA conference, 10-13 April 2022, Jönköping, Sweden.

Paper III
Ghanei, J. (2023), 'Climate alignment with transport providers and customers in the procurement of transport services'.

Work in progress paper to be submitted to an international journal.

The earlier version of this paper entitled 'Goal-oriented transport procurement; shippers' perspective' was peer-reviewed and presented at the Annual LRN conference, 7-9 September 2022, Birmingham, The United Kingdom.

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I hope that this work, provides the reader with useful insights and aids us all in mitigating climate change.

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1. Introduction

It is necessary to reduce CO_2 emissions in time to avoid the possible domino effects of several climate tipping points (Lenton et al., 2019). When it comes to logistics activities, it is stated that 'given the magnitude of carbon reductions that logistics planners and managers will have to deliver over the next few decades, it is important that decarbonisation is approached systematically and in a way that fully exploits all the opportunities' (McKinnon, 2018, p.16). Transport activities are central in decarbonisation of logistics as apart from their functional importance, they have the most climate impact within logistics activities (Ries et al., 2017, Wolf and Seuring, 2010).

An absolute majority of transport activities in Europe and Sweden are the result of procurement of transport services - 86% and 90%, respectively (European Commission, 2017). Despite the prominent role of the procurement of transport services in the transport decarbonisation, a study in the European domain suggests that the regulatory, market and competitive pressures on companies that procure transport services (henceforth, shippers) to reduce CO_2 emissions are mainly centred around their own business functions and that little attention is paid to the procured logistics services (Jazairy and Haartman, 2020). An earlier study about shippers in the American domain draws similar conclusion and suggests that institutional pressures on shippers to reduce their CO_2 emissions from procured transport services are weaker than those for owned assets, such as manufacturing or distribution facilities (Ellram and Golicic, 2015). It is, however, inferred from the literature that shippers respond differently to external pressures to reduce CO_2 emissions from procured transport services. Different responses are motivated by a different organisational context. A study by Jazairy and Haartman (2020) about shippers in Germany and Sweden, highlights the role of managerial commitment as response moderator to calls for the reduction of environmental impacts of logistics practices. It is suggested that managerial commitment is influenced by the following variables: managers' interpretation of pressures (i.e., as opportunity or as threat), top management support, economic conditions and organisational structure (Jazairy and Haartman, 2020). Yet another study in the European domain emphasises the role of supportive employees or top management in shippers' climate commitment in France (Touratier-Muller and Ortas, 2021).

Previous research, however, suggests that shippers' organisational climate commitment faces challenges in the procurement of transport services. Shippers are not able to reduce CO_2 emissions from transport independently, as they have to satisfy needs, demands or requirements of other companies upstream and downstream the supply chain in wider logistics setups. The involvement of transport providers and customers in the transport procurement process makes it challenging for shippers to reduce CO_2 emissions, as these actors have different goals and priorities based on their own conditions (Forslund et al., 2021). Customers can be a particular hindrance for shippers' decarbonisation in transport because of their non-environmental demands such as time-related ones (Björklund, 2011). Meeting customers' time-related demands is not always compatible with shippers' climate performance (Isaksson, 2019). Shippers need to focus on the design of transport performance metrics to be able to manage incompatible traditional transport performance metrics, e.g., price and time-related ones with climate performance (cf. Melynk et al., 2004; Caplice and Sheffi, 1995). Shippers are encouraged to improve efficiency of transport by managing their relationships with their customers and transport providers (Eriksson et al., 2021; Andersson et al., 2019) and to use appropriate coordination mechanisms to manage their dependencies on transport providers to reduce CO_2 emissions from transport (Sallnäs, 2016). Apart from transport providers and customers, shippers need to focus on their internal processes during the procurement of transport services to reduce CO_2 emissions through increasing load factors (Rogerson and Sallnäs, 2017) or increasing interfunctional alignment when it comes to climate performance

(Jazairy, 2020). However, context is important to consider, and shippers might be constrained by the influence of context in the management of procurement of transport services. Previous research suggests that contextual factors influence shippers' requirements on transport services (Hedvall et al., 2017). This infers that shippers cannot always contribute to efficiency of transport, as they need to adapt to the context and the adaptation impacts on their climate performance (cf. Caplice and Sheffi, 1995).

As elaborated above, shippers need to manage their internal processes and dependencies on their transport providers and customers purposefully, to be able to reduce CO_2 emissions in the procurement of transport services. However, both intra- and interorganizational context is expected to influence shippers' climate performance. Despite all dependencies on transport providers and customers and the influence of context on shippers' climate performance, shippers still have an important role in decisions related to the distribution network (Bask and Rajahonka, 2017), mode of transport (Bask and Rajahonka, 2017; Liljestrand et al. 2015) and load factors (Rogerson and Sallnäs, 2017; Liljestrand et al. 2015); that impact on emissions from transport (McKinnon, 2018). Therefore, it is important that shippers willing to reduce CO_2 emissions, manage the procurement of transport services purposefully to realise their organisational climate commitment.

1.1. Purpose and research questions

It was demonstrated in the previous section that shippers' varying responses to external pressures to decarbonise their transport are explained by different contexts in which they operate. Existing research highlights the importance of context and the role of organisational climate commitment in the reduction of CO_2 emissions from transport. However, it is less clear how contextual factors influence transport procurement and how the transport procurement can be managed to reduce CO_2 emissions. The purpose of this thesis is to explore how organisational climate commitment can be realised in the procurement of transport services. This thesis through a case study, focuses on a shipper's managerial practices within the organisation and in relation to its transport providers and customers to realise its organisational climate commitment in the procurement of transport services. Organisational climate commitment is defined in this licentiate thesis as the organisation's commitment to decarbonise transport which is mirrored in managerial commitment to decarbonise transport in the procurement of transport services and is communicated by the organisation's declared climate-related goals. Organisational climate commitment acts as response moderator to pressures on shippers to reduce CO_2 emissions in transport (see Jazairy and Haartman, 2020). Organisational climate commitment will be referred to as climate commitment for the sake of brevity. To enable a systematic inquiry, this research focuses on the procurement process and relies on how it has been described in previous research.

To provide a deep insight into the management of a transport procurement process aiming at realising climate commitment, we need first to improve our understanding of how shippers are influenced by the context in which they operate (cf. Jazairy and Haartman, 2021; Rogerson, 2016). This is important to consider due to two reasons: first, it would be difficult for shippers to take measures to reduce CO_2 emissions in a relationship that involves high levels of unmanageable uncertainties (cf. Gadde and Wynstra, 2018). Second, lasting relationships are important for transport providers to invest in climate mitigation measures (Jazairy, 2020). Apart from the importance of enduring relationships for the cause of positive climate performance, the specification of transport-related criteria (e.g., transport time) has the most impact on logistical variables (e.g., length of haul) which in turn determine CO_2 emissions (Rogerson, 2016). It is suggested that shippers' requirements on transport services have an impact on resource efficiency and are influenced by the context (Hedvall et al., 2017). Finally,

shippers need to adapt to the context in the specification of transport services that might have undesired effects on their climate performance (cf. Caplice and Sheffi, 1995).

The literature emphasises the influence of contextual factors on the procurement process in general. Johnston and Lewin (1996) present several contextual factors influencing the procurement process, including suppliers, competitors, legal framework, organisational and group characteristics. Other scholars have emphasised the role of context in adopting a procurement strategy (Kraljic, 1983) and a logistics strategy (Haglund, 2022). In the literature of transport procurement, Björklund (2011) emphasises that it is important to have knowledge about context to achieve high environmental performance. It has been noted that contextual differences can alter procurement process configurations (Rogerson, 2016). The transport procurement process in a study by Rogerson (2016) includes service specification, supplier selection and contracting, whereas the contextual factors include the purchasing task (i.e., procurement strategy), importance of transport (e.g., cost of transport) and service type (e.g., complexity of transport planning). To serve the purpose of this thesis and in line with the previous research this thesis expands the scope of contextual factors in focus and formulate the following research question to study the influence of contextual factors on the procurement of transport services:

RQ1: How do contextual factors influence shippers' procurement of transport services?

To fulfil the purpose of this thesis, there is a need to develop knowledge about how shippers can manage the procurement of transport services to reduce their CO_2 emissions. Previous research has provided valuable insights into the challenges of shippers' traditional performance metrics (e.g., cost and time-related ones) being incompatible with climate performance (Jazairy, 2020; Bask et al., 2018), the shippers' adoption of adequate internal processes to enable high load factors (Rogerson and Sallnäs, 2017), the importance of shippers' intraorganisational alignment before placing demands on transport providers (Jaziary, 2020) and how coordination mechanisms between shippers and transport providers are influenced by dependencies between the two actors (Sallnäs, 2016). However, the shippers' perspective on the management of the procurement of transport services with the aim of reducing CO_2 emissions has not been fully explored. For example, little is known about how transport performance systems can be managed to realise both climate performance and traditional transport performance objectives, how intraorganisational alignment is facilitated, how interfunctional coordination is fostered or how dependencies on the transport providers and on the customers in the procurement of transport services can be managed to realise the climate commitment. To fulfil the purpose of this thesis, the following research question is formulated to capture the transport procurement process and the way it is managed for a better climate performance, within the organisation and in relation to the transport providers and customers:

RQ2: What does shippers' climate commitment imply for transport procurement?

1.2. Research scope

This licentiate thesis (henceforth thesis) adopts the perspective of companies that procure transport services (i.e., shippers). Shipper (i.e., the focal firm) in this thesis is defined as a company that has a separate transport contract regardless of whether the transport in question is inbound or outbound. As a result of this definition, those transport services that are included in larger procurement contracts for products or materials are outside the scope of this thesis.

1.3. Outline of the thesis

This thesis consists of a cover and three papers. In section 2, the frame of reference is presented. Thereafter, the method is described in section 3. Section 4 presents the main findings from the papers. Section 5 discusses how the main findings from the papers contribute to the purpose of this thesis. The conclusions in this thesis are presented in Chapter 6.

2. Frame of reference

Subsection 2.1 (transport procurement process) describes the transport procurement process by which the transport procurement is studied in a systematic manner. Subsection 2.2 (shippers' realisation of climate commitment) describes theoretical backgrounds for shippers' managerial practices to realise the climate commitment. Subsection 2.3 defines the contextual factors and describes previous research on their influence on shippers' procurement of transport services. Figure 1 introduces how the frame of reference is divided into subsections and how the subsections are connected to the research questions.

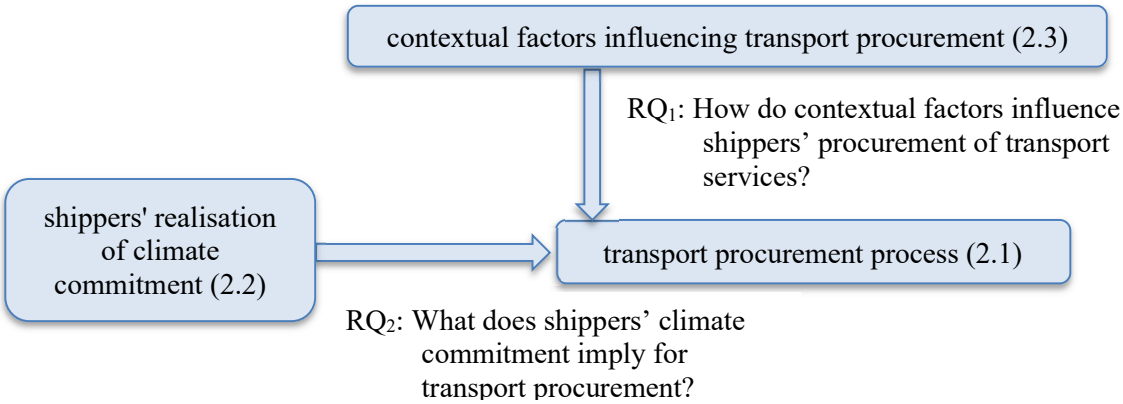

Figure 1. Frame of reference in relation to the research questions

2.1. Transport procurement process

The procurement process can be viewed from two different time perspectives: a short-term perspective which concerns individual procurements and a long-term perspective which deals with procurement strategy (Axelsson and Wynstra, 2002). Individual procurements are illustrated as models of decision processes with consecutive steps that by definition concern individual transactions (Axelsson and Wynstra, 2002) and aim to structure procurement decision making (van Weele and Rozemeijer, 2022). However, they might differ from one transaction to the next based on earlier experience, complexity of the transaction and uncertainty (Axelsson and Wynstra, 2002). A linear process is presented by van Weele and Rozemeijer (2022), which consists of sequential decision-making steps, and this method is stated by van Weele and Rozemeijer (2022) to be useful for simple procurements in contrast to category management that warrants more sophisticated processes. The application of van Weele's (2000) procurement process by Axelsson and Wynstra (2002) for service procurement suggests the suitability of the process described by van Weele and Rozemeijer (2022) for the procurement of logistics or transport services. The linear procurement process that van Weele and Rozemeijer (2022) present has also been used by Rogerson (2016) to study the transport procurement process.

The distinct features of service procurement make it quite distinct from the procurement of goods (Axelsson and Wynstra, 2002). Services are intangible and heterogeneous which are consumed at the same time as they are produced (Andersson and Norrman, 2002). This makes the task of service specification (see Figure 2) especially important as it is difficult for both buyer and supplier to know the exact content of the service and to be able to discuss it (Axelsson

and Wynstra, 2002). Previous research by Andersson and Norrman (2002) suggests that two important questions – what to specify and who specifies it – are central to the specification of service. Service specification has a sizable impact on the climate performance of transport because it has an impact on logistical variables such as length of haul (Rogerson, 2016). The influence of shippers' requirements on transport services is important from the perspective of resource utilisation of transport providers (Hedvall et al., 2017).

The prime value of the procurement process is that it differentiates key steps of the process (van Weele and Rozemeijer, 2022). Thus, this thesis uses the transport procurement process for its elucidatory value that enables a systematic inquiry into the research and relies on how it is described in previous research. Figure 2 illustrates the transport procurement process adapted to the transport procurement in this thesis.

Figure 2. Transport procurement process, inspired by van Weele and Rozemeijer (2022)

The transport procurement process starts with the specification of transport-related criteria. In this step, the list of shippers' needs is specified (Rogerson, 2016). Transport provider selection is carried out next during which the transport provider is selected (cf. van Weele and Rozemeijer, 2022). Terms of agreement between shipper and transport provider is contracted after the selection of the transport provider (cf. van Weele and Rozemeijer, 2022). During the ordering step of the transport procurement process, shippers call transport providers to carry out transport activities (cf. van Weele and Rozemeijer, 2022). Finally, shippers follow up and evaluate the performance of transport (cf. van Weele and Rozemeijer, 2022). The assumption is that the shipper's climate commitment is realised through the transport procurement process where several functions within the shipper's organisation, as well as the shippers' transport providers and customers, are directly or indirectly involved. In the next section, the literature relevant to shippers' realisation of climate commitment within the organisation (inward) and in relation to transport providers and customers (outward) is explored.

2.2. Shippers' realisation of climate commitment

Previous studies have suggested that shippers' realisation of the climate commitment is not a straightforward managerial task as customers and transport providers are directly or indirectly involved in the procurement of transport services with different goals and priorities based on their own conditions (Forslund et al., 2021; Björklund, 2011). These differing perspectives on climate performance influence shippers' interfunctional relations (Jazairy, 2020), the coordination mechanisms that are used by shippers to manage dependencies (Sallnäs, 2016) and make shippers' climate performance challenging (cf. Melnyk et al., 2004; Caplice and Sheffi, 1995). In this section, the prior research is explored regarding shippers' realisation of climate commitment in relation to their transport providers and customers (i.e., outward realisation of climate commitment) and when it comes to shippers' managerial practices within the organisation (i.e., inward realisation of climate commitment).

Outward realisation of climate commitment

The challenge of misalignment between the shippers' and the transport providers' positions on issues related to climate performance has been reported in several studies. Shippers and transport providers 'in relation to the environmental dimension of logistics, ambition levels, as well as the actual offerings and requirements, are poorly aligned' (Huge-Brodin et al., 2020, p.597). Other studies draw similar conclusions about misalignment between shippers and transport providers on offerings and requirements when it comes to transport services which

has consequences for climate performance (Huge-Brodin and Sallnäs, 2018; Martinsen and Huge-Brodin, 2014; Martinsen and Björklund, 2012). Previous research emphasises shippers' interorganisational activities to reduce CO_2 emissions from transport (e.g., Jørsfeldt et al., 2016). Sallnäs (2016) uses Mintzberg's (1989) coordination mechanisms to study how dependencies between shippers and transport providers influence the way environmental practices are coordinated between shippers and transport providers and suggests different coordination mechanisms between them based on their environmental ambitions and type of dependencies between them. These coordination mechanisms are mutual adjustment (i.e., when individuals or groups adapt to each other), direct supervision (i.e., someone gives instructions to those who carry out the task), standardisation of work (i.e., design of work), standardisation of output (i.e., results are standardised), standardisation of skills (i.e., people are trained to know what to expect from each other) and standardisation of norms (i.e., through common values and norms). This thesis uses Mintzberg's (1989) coordination mechanisms to study what managerial practices are used to manage dependencies on the transport providers and customers to realise their climate commitment when it comes to the activity of transport.

However, coordination mechanisms are referred to as alignment mechanisms in this thesis. This is motivated by the inference from the literature that coordination is centred around activities (Wong et al., 2012), whereas shippers' challenges in relation to their transport providers and customers when it comes to realisation of climate commitment stems from organisational goals and priorities. Therefore, alignment mechanisms better describe the intention of shippers when managing dependencies on their transport providers and customers as alignment focus on the fit between organisations' strategies (Gattorna, 2016), objectives and policies (Houlihan, 1985). However, shippers' dependency on their transport providers and customers impact shippers' own goals and priorities when it comes to the climate performance. For example, from shippers' perspective, logistics systems are measured based on service (e.g., transport time), costs and tied-up capital and recently CO_2 emissions (Björklund and Forslund, 2013). The metrics based on which performance of transport is measured have an important role in the reduction of CO_2 emissions from transport. This is because traditional transport metrics, such as service, might not be compatible with reducing CO_2 emissions (Isaksson et al., 2019). The compression of transport time is an enduring trend in the transport sector (Isaksson et al., 2019; McIntyre and Smith, 1998) that encourages faster and less fuel-efficient modes of transport (McKinnon 2016). This implies that shippers need to manage the transport performance metrics to realise their climate commitment. The literature is explored in the next subsection to find indications of how inward realisation of climate commitment can be achieved.

Inward realisation of climate commitment

To address the incompatibility of the different goals of performance, Caplice and Sheffi (1995) suggest that decision-makers need logistics performance metrics that complement and support each other, which together help decision-makers to better understand the situation (Caplice and Sheffi, 1995). According to them, performance metrics need to be vertically integrated (i.e., they mirror organisation's overall strategy); horizontally integrated (i.e., they involve all pertinent functions in the process); comprehensive (i.e., they include relevant perspectives); causally oriented (i.e., they do not lead to undesired effects); comparable (i.e., they enable trade-offs); and useful (i.e., they are easy to understand by managers). Caplice and Sheffi (1995) use the term integration to refer to overcoming functional isolations, but other authors have used other terms to refer to the state of overcoming interfunctional silos. These terms are alignment, coordination and cooperation (Jørsfeldt et al., 2016). In this thesis, the line of argument of Melnyk et al. (2004) in the context of performance measurement is followed and the term integration, as used by Caplice and Sheffi (1995), denotes alignment when referring

to hierarchies in the organisation and to coordination when referring to managing interfunctional dependencies.

In this thesis it is argued – inspired by Caplice and Sheffi (1995) – that the realisation of climate commitment within transport is contingent on the realisation of a transport performance system based on metrics that are vertically aligned, horizontally coordinated, comprehensive, causally oriented, comparable and useful. However, as was argued earlier, contexts influence shippers' procurement of transport services (Rogerson et al., 2014) and that in turn influences shippers' performance (cf. Caplice and Sheffi, 1995). In the next section, these contextual factors are explored in the literature.

2.3. Contextual factors influencing transport procurement

Organisational buying is a dynamic, intricate, multiphase, multiperson, multidepartmental and multiobjective process that is influenced by contextual factors either directly or indirectly (Johnston and Lewin, 1996). Previous research within organisational buying behaviour synthesises nine constructs as contextual factors that influence the organisational buying, namely environmental (e.g., legal, economic, suppliers, customers); organisational (e.g., size, reward system); group (e.g., authority, leadership); participant (e.g., education, motivation); purchase (e.g., complexity, importance); seller (e.g., price, product quality); conflict/negotiation (e.g., persuasive, cooperative); informational (e.g., message sources, distortion); and process (Johnston and Lewin, 1996).

Apart from the general model that Johnston and Lewin (1996) present, authors have mentioned contextual factors that influence the procurement of transport services. In a study by Björklund (2011), the character of 54 contextual factors that can influence the inclusion of environmental concerns in the procurement of transport services are grouped into these categories: management, measurement/reward system, employees, product characteristics, owners, image, purchasing function, resources of the company, customers, transport providers, competitors, product suppliers, transport manufacturers and government and authority. In an earlier study, Björklund (2005) lists more than 200 factors from the literature that can either facilitate or hinder environmentally preferable transport procurement practices.

The role of environmental awareness and the priorities among the top/middle management are described as 'very important' drivers in the environmental procurement of transport services (Björklund, 2011). A French study reports that supportive employees or top management are driving forces of shippers' environmental sensitivity (Touratier-Muller and Ortas, 2021). A study of shippers in Germany and Sweden highlights the role of the contextual factors that act as pressure moderators, which stem from market and organisational characteristics, and include industry, operating country, visibility, internationalisation and size (Jazairy and Haartman, 2020). The same study highlights the role of managerial commitment as response moderator to calls on decarbonise logistics activities (Jazairy and Haartman, 2020). Managers filter and transform institutional pressures when the pressures penetrate a company's boundary in correspondence to the company's uniqueness (Liu et al., 2010; Levy and Rothenberg, 2002). It can be argued that the effect of context explains why companies that operate within the same institutional context experience different levels of pressures (Delmas and Toffel, 2004) and why, despite similar stakeholder pressure, some shippers are more interested in climate mitigation measures than others (Martinsen and Huge-Brodin, 2014).

Previous research within transport procurement emphasises the influence of three contextual factors: service type (e.g., location of recipients/senders), importance of transport (e.g., transport cost) and purchase task (e.g., supplier relationship approach). These factors influence the transport procurement process and their influence can be observed on the configuration of the process (Rogerson, 2016). When the purchase situation is complex and the service type is complicated, shippers specify transport-related criteria in detail regardless of the

degree of closeness of the relationship with transport providers (Rogerson et al., 2014). Shippers have different motives when it comes to adjusting the level and type of their involvement in the specification of transport services (cf. Gadde and Wynstra, 2018) through requirements on transport, for example, the characteristics of the product (Hedvall et al., 2017). The involvement of shippers in the specification of transport services occurs despite its likely adverse impact on transport efficiency (and cost) and climate performance (cf. Hedvall et al., 2017). Thus, it can be argued that the context is a dimension for shippers to consider when they plan for their transport performance and ensuring the reduction of CO_2 emissions in relation to their transport providers and customers. For the sake of the feasibility of this research, the scope of contextual factors influencing the transport procurement needs to be delimited. This thesis focus on the following contextual factors that have either impact on shippers' climate commitment (industry, size of organisation and profession) or on the configuration of transport procurement process (buying organisation, service type, importance of transport and purchase task):

Industry
Industry's role in the procurement process is emphasised in the literature in relation to the influence of technological change, sources of supply and government regulations (Johnson et al., 2002). It is also suggested that different industries imply distinct stakeholders that lead to different environmental responses on the part of shippers (Jazairy and Haartman, 2020).

Size of organisation
It is reported that small and medium-sized shippers lack competence in the procurement and that they are in a less-favoured power position in their relationship with transport providers (Holter et al., 2008). The role of the size of shippers' organisation has also been mentioned from the perspective of the pressures from stakeholders for more environmental procurements that are expected from larger companies (Jazairy and Haartman, 2020).

Profession
Education, perception, or experience of participants in the procurement process influence the results of the process (Johnston and Lewin, 1996). Managers also transform institutional pressures on organisations when it comes to environmental performance in reference to the company's context (Liu et al., 2010; Levy and Rothenberg, 2002). The role of profession is important in responding to pressures on shippers to effect reduction of CO_2 emissions (Jazairy and Haartman, 2020).

Buying organisation
Degree of (de)centralisation of procurement organisation is the most common variable used in procurement research with focus on relationship between (de)centralisation and the efficiency of procurement process, determinants of (de)centralisation and (de)centralized procurement organisations in different industries (Glock and Hochrein, 2011).

Service type, purchase task and importance of transport

This thesis relies on Rogerson et al. (2014) in defining variables pertaining to service type, purchase task and importance of transport:

1. Service type is defined by variables such as how repetitive the location of recipients or senders of goods are.
2. Purchase task is defined by variables such as number of services that determines whether a shipper procures only transport services or procures other logistics services too.
3. Importance of transport that is defined by variables such as transport cost and unique driver (i.e., whether transports create a competitive advantage for a shipper).

2.4. Model of analysis

The purpose of this thesis is to explore how organisational climate commitment can be realised in the procurement of transport services. This purpose is broken down into the following two research questions:

RQ_1: How do contextual factors influence shippers' procurement of transport services?

RQ_2: What does shippers' climate commitment imply for transport procurement?

To address these research questions, it is necessary to define contextual factors, procurement of transport services and shippers' realisation of climate commitment. Previous research is explored and presented in sections 2.3, 2.1 and 2.2 to define contextual factors, procurement of transport services and shippers' realisation of climate commitment, respectively. Starting from the contextual factors, this thesis studies the influence of contextual factors industry, size of shippers' organisation, profession, buying organisation, service type, purchase task and importance of transport (see subsection 2.3) on the procurement of transport services that is limited to the specification of transport-related criteria in this thesis (see Figure 3). When it comes to the procurement of transport services, it is studied based on transport service specification, transport provider selection, transport contracting, transport ordering and the follow-up and evaluation of transport services (see subsection 2.1).

As was noted in subsection 2.2, the realisation of climate commitment implies both outward and inward managerial practices in the organisation (see Figure 3). Outward managerial practices aim at a shipper's alignment with its transport providers and customers on climate performance. In this thesis, it is assumed that the alignment is achieved by adopting alignment mechanisms which are mutual adjustment with transport providers and customers, direct supervision of transport providers and customers, standardisation of work for transport providers and customers, standardisation of output for transport providers and customers, standardisation of skills for transport providers and customers and standardisation of norms for transport providers and customers. Inward managerial practices (see subsection 2.2) in this thesis are assumed that aim at adapting transport performance system to the climate commitment that in turn implies that the realisation of climate commitment is contingent on the realisation of several characteristics of transport performance metrics (see Figure 3). Transport performance metrics need to be vertically aligned, horizontally coordinated, comprehensive, useful, casually oriented, and useful. Figure 3 presents the model of analysis in the thesis that constitutes the theoretical assumptions mentioned above.

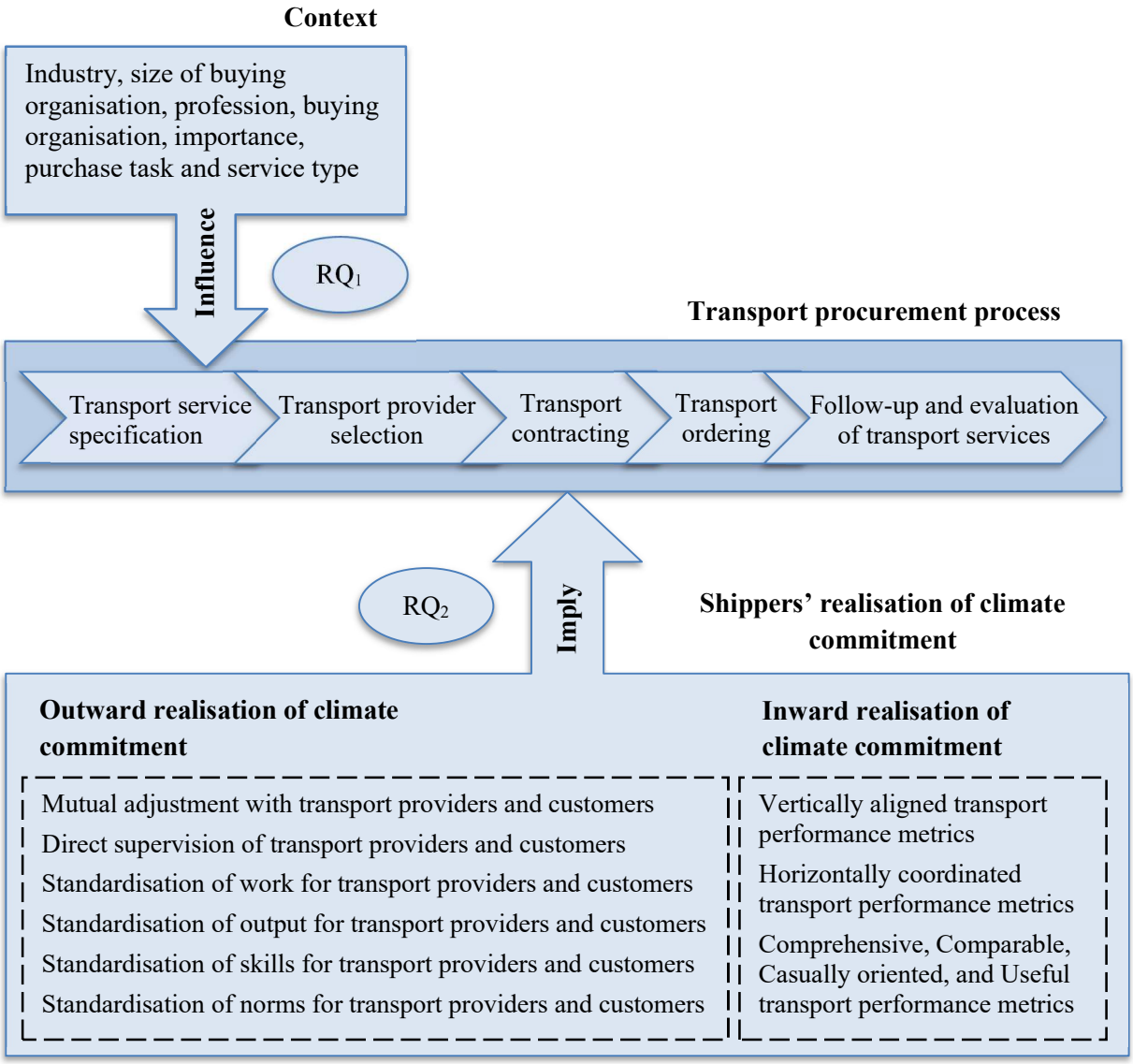

Figure 3: Model of analysis in this thesis

3. Method

The purpose of this thesis is broken down into two research questions that are answered through one quantitative study (Survey Study) and two qualitative studies (Interview Study and Case Study) which result in three papers. Figure 4 illustrates the relations between the studies, the papers, and the research questions of the thesis:

RQ_1: How do contextual factors influence shippers' procurement of transport services?
RQ_2: What does shippers' climate commitment imply for transport procurement?

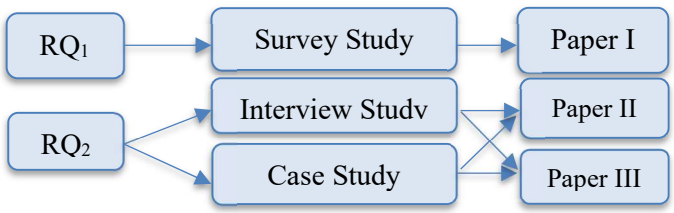

Figure 4. Relations between the research questions, studies and papers

An overview of the studies and papers are presented in Table 1. The first study is a quantitative study based on a survey that is referred to as Survey Study in this thesis. The second study is based on interview with four shippers (Interview Study) and the third one in a case study (Case Study). These studies are redescribed more in detail in upcoming subsections.

Table 1. An overview of the studies and papers

	Studies	Survey Study	Interview Study	Case Study
	Papers	Paper I	Papers II and III	Papers II and III
	Method	Quantitative	Qualitative	Qualitative
Relevance to the frame of reference	Transport procurement process	✓	✓	✓
	Contextual factors influencing transport procurement	✓		
	Shippers' realisation of climate commitment		✓	✓
	Climate focus		✓	✓

3.1. Survey Study

Results of the Survey Study are presented in Paper I. The Survey Study used a survey which is a part of an ongoing survey study that is conducted by IVL Swedish Environmental Research Institute, Chalmers university of technology and Gothenburg university (see Transport Purchasing Panel, 2022). The survey is sent to shippers with more than 100 employees in Sweden every other year. The project initiated in 2012 and survey design had withstood several rounds of data collection and analysis prior to being utilised for this thesis. The survey design is not a part of the research process in this thesis. Data collected from the survey in 2018 were used in the Survey Study.

The Survey Study examines the influence of contextual factors on level of involvement of shippers in the specification of transport-related criteria in detail. A conceptual framework was developed based on the literature to analyse the data which had been already collected in 2018. The conceptual framework suggested that the following contextual factors influence the level of involvement of shippers in the specification of transport-related criteria: size of shippers' organisation, industry, profession of responsible person, buying organisation, purchase task, service type and importance of transport (see subsection 2.3). Table 2 provides more information about the Survey Study and its resultant paper.

Table 2. Information about the Survey Study

Survey Study	Paper I
Title	Importance of context when specifying transport services
Research question	What is the influence of contextual factors on the actors' involvement in specifying transport-related criteria?
Method	Quantitative
Unit of analysis	Shippers
Independent variables	Industry, size of shippers' organisation, profession, service type, importance of transport and purchase task
Dependent variables	Specificaiton of: vehicle and equipment, subcontractor, mode of transport, work instructions, transport time and time precision.
Climate focus	Indirect
Contribution to the RQs in the thesis	RQ_1

Method choice

Survey was chosen as a research method because of the study's purpose, which was to examine what contextual factors, based on taxonomic groups, influence which actor (shipper, transport provider or whether they work jointly) specifies transport-related criteria. This was important to know because the initial literature review highlighted the importance of actors' level of involvement in the transport procurement process in relation to transport efficiency and noted heterogeneity among shippers in relation to their involvement in the procurement of transport services. Sayer (2000) emphasises the usefulness of extensive research (i.e., how extensive a certain pattern, property or relation is in a population) in studying companies as members of taxonomic groups such as industries.

Data collection and analysis

The survey was sent to a random sample of manufacturers and wholesalers with more than 100 employees in Sweden that procure transport services. The survey was sent to 336 companies in November and December 2018 and was completed by 146 shippers which resulted in a response rate of 43%. The survey consisted of 39 questions of which many were based on a 7-point Likert scale; only a selection of questions is used in Paper I. The model of analysis in paper I depicted the influence of contextual factors on the level of involvement of shippers in the specification of transport-related criteria (e.g., transport time) in detail. Relevant questions from the survey were selected and the data collected were analysed using SPSS in accordance with the model of analysis.

Research quality

Conceptual model and data analysis in Paper I are based on previous research and scrutinised selection and use of statistical tools. An issue pertaining to survey studies needs be addressed and that is the criticism of perceptual measures in survey studies (Forza, 2002). How to make sure that the scale of '7' or '1' in a 7-point Likert scale is interpreted by respondents in the

same way? Despite this criticism, however, perceptual measures have been widely accepted because they are viable in large-scale studies. To increase the study reliability, efforts were made to reach the targeted respondents (Boyer and Pagell, 2000); i.e., a person who is familiar with the survey topic. The respondents were carefully targeted by calling companies and confirming that they held managerial positions and worked with the procurement of transport services. Thus, it can be argued that those who completed the survey were respondents and not informants, reporting on a phenomenon external to them (see van Weele and van Raaij, 2014).

Another noteworthy point to mention about the survey quality is the relevance of the sample to the theoretical domain of the study (see van Weele and van Raaij, 2014). Focus of the study is the specification of transport-related criteria and because such a specification occurs in a relationship, one might argue that the theoretical domain of the study is dyadic relationships between shippers and transport providers and therefore, the research needed to have been conducted from a dyadic perspective. However, the purpose of the study was to study the level of involvement of shippers in the specification of transport services in non-interlinked relationships from shippers' perspective and therefore, distributing the survey to transport providers in addition to shippers would not have affected the responses of shippers. Therefore, the relevance of sample to the theoretical domain of the study is satisfactory.

3.2. Interview and Case Study

The research resulting in Papers II and III, was initiated by interviewing four shippers in what is called the Interview Study in this thesis. After this study, it was decided to conduct a case study to gain more in-depth insight into how a shipper realises its climate commitment in the procurement of transport services.

These two studies together, result in two papers: Paper II and Paper III. Each paper has a distinct focus and frame of reference. Paper II centres around a shipper's transport performance system and its related complete and supportive performance metrics. The purpose of this paper is to investigate how climate performance is realised despite different organisational goals in relation to transport performance. Paper III explores how climate alignment with transport providers and customers is ensured in the procurement of transport services. Table 3 provides information about these studies and their associated papers.

Table 3. Information about the Interview Study and the Case Study

	Paper II	Paper III
Title	What does it take to reduce CO_2 emissions in a multiple-goal transport performance system?	Climate alignment with transport providers and customers in the procurement of transport services
Research question	How is climate performance realised despite different organisational goals in relation to transport performance?	How is climate alignment with transport providers and customers ensured in the procurement of transport services?
Study	Interview Study and Case Study	Interview Study and Case Study
Method	Case study of which findings are supported by extra interviews	Case study of which findings are supported by extra interviews
Unit of analysis	Focal perspective of a single actor (shipper)	Focal perspective of a single actor (shipper)
Contribution to the RQs in the thesis	RQ_2	RQ_2

Method choice

The research purpose of the Case Study warranted case study approach because it focused on examining phenomena in organisations and relationships (Easton, 2010) and aimed at exploring and developing theories (Voss et al., 2002). This thesis has close ties with logistics in which context is important and case study is recommended as research method (Frankel et al., 2005). After interviewing four shippers, it was decided to conduct a case study. This is because a case study provides in-depth insights and it is useful to study the phenomenon in its context (Easton, 2010; Flyvbjerg, 2006).

Shippers for which climate performance was of importance were selected for both studies. Shippers were selected based on their declared climate commitments, and that their climate ambitions included transport services. The shipper in the Case Study was selected according to the same rationale, and it was also important that the company had both in-house transport activities and procured transport services. It was anticipated that by studying this company it is more likely to discover the state of alignment of operational aspects of transport with the strategic goals of the organisation. This expectation was legitimate, because the literature suggests that pressures on shippers to reduce CO_2 emissions largely focus on their own facilities and activities (Jaziary and Haartman, 2020; Ellram and Golicic, 2015).

Data collection and analysis

Data from the Interview Study were collected in winter 2021 and spring 2022 via four semi-structured interviews with four shippers. A case study was conducted afterwards, via semi-structed interviews with four transport managers and two environmental experts to gain more in-depth insight into the realisation of climate commitment as it was appeared from the Interview Study that shippers' dependencies on their transport providers and customers had an impact on shippers' climate performance (more information about data collection and data analysis is found in Papers II and III). To secure multiple data sources, secondary data were obtained from the companies' websites, in addition to their sustainability reports; this provided additional data on the companies' climate mitigation measures and validated interview data.

These secondary data sources also allowed for relevant follow-up questions during and after interviews. The interview protocol was designed inspired by the literature and was completed with questions regarding background information about shippers' transport activities.

The research started with a literature review and a conceptual framework was separately constructed for Paper II and Paper III. Data collected from the Case Study were the basis of data analysis for Paper II and Paper III. The data collected from the Interview Study were supporting results from the Case Study. Data were analysed separately for papers II and III following the concepts of the frameworks for each paper.

Research quality

For the Interview Study, one person in each organization was interviewed. This can create limitation concerning single respondent bias (Ellram and Golicic, 2015). However, similar to the study by Ellram and Golicic (2015), interviewees were reporting actual company activities or policies that is more objective in nature. In accordance with Halldórsson and Aastrup (2003) the research quality is presented based on the following criteria: credibility, transferability, dependability and confirmability.

Credibility

All interviews were conducted in Swedish (main language of respondents), were audio recorded and transcribed after interviews. To enhance research credibility, respondents were sent the interview questions and their answers and asked to comment, modify, add or delete, after which they submitted their respective confirmation. Secondary data derived from companies' sustainability reports and website information were utilised in both the Interview Study and in the Case Study for data triangulation. These measures are deemed to improve research credibility which is defined as 'the degree of match between the respondents' constructions and researchers' representation of these' (Halldórsson and Aastrup, 2003, p. 327).

Transferability

A description of the case studied in Papers II and III were provided in each paper to improve research transferability. As Selviaridis and Spring (2010, p. 175) suggest 'to some extent, generalisability is in the eye of the beholder; readers will judge how much the causal mechanisms revealed [in an extreme case study] may be present and active in other settings.' Transferability is defended as 'the extent to which the study is able to make general claims about the world.' (Halldórsson and Aastrup, 2003, p. 327).

Dependability

To improve dependability, all interviews were recorded, transcribed, and archived. These measures are deemed to improve the dependability as they are concerned with trackability that is achieved through documenting the logic of process and method decisions (Halldórsson and Aastrup, 2003).

Confirmability

To comply with this criterion, the audio-recorded interviews were stored. Moreover, the data collected from respondents were analysed in light of data obtained from sustainability reports and available online data. These measures improve the findings' representativeness of the inquiry and not the researchers' biases (Halldórsson and Aastrup, 2003, p.328).

3.3. Thesis progress

Figure 5 delineates research progress thus far. This research was initiated in March 2020 as part of the 'future fossil-free freight transport systems' project conducted by Triple F. Triple F

is the Swedish Transport Administration's research and innovation initiative that stands for 'Fossil Free Freight.'

Paper I and Paper II were initially presented at the IPSERA Conference 2021 and 2022 respectively. Feedback from the conferences were considered in the developing the articles before submitting them to journals. Paper III was presented at the LRN Conference 2022.

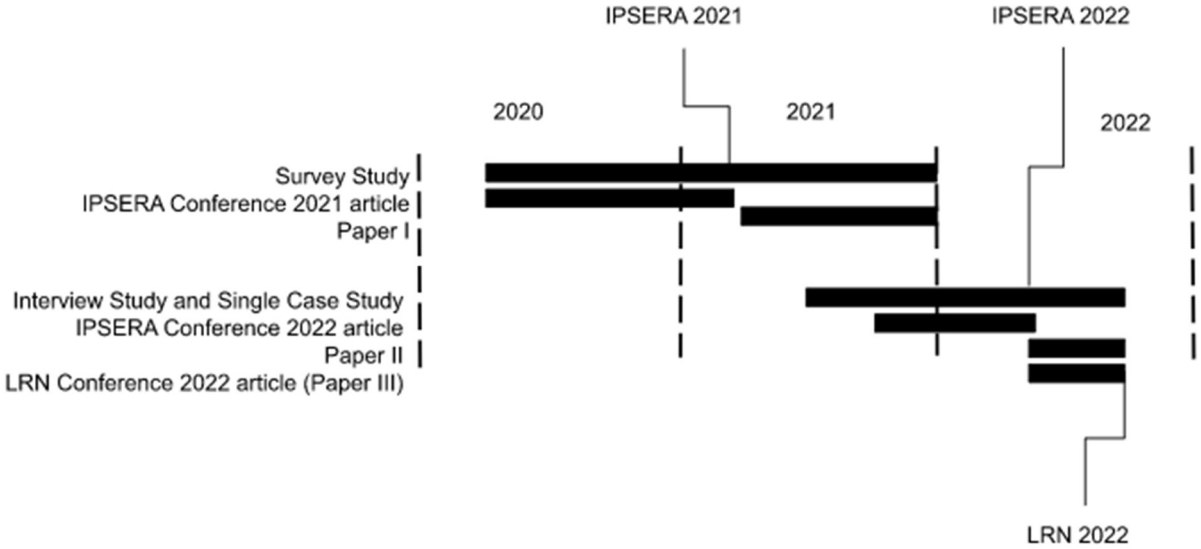

Figure 5. Timeline for the research progress, delineated by the studies and the papers

4. Findings

This section presents the main findings of the papers. A summary of main findings is presented in subsection 4.1 (see Table 4) in relation to the research questions of the respective paper. These findings are based on empirical data which are elaborated more in detail in subsection 4.2. The findings in Table 4 are discussed in section 5 to answer the research questions of the thesis.

4.1. Summary of main findings from papers

In this subsection, a summary of main findings from papers is presented in relation to the research questions of the respective paper.

Table 4: Summary of main findings from papers

Research question of papers	Findings	Paper
What is the influence of contextual factors on the actors' involvement in specifying transport-related criteria?	Shippers' industry, size of shippers' organisation, profession of responsible person for the procurement of transport services (e.g., transport manager, procurement manager), purchase task (e.g., size of contract) and service type (e.g., variation in location of recipients) are all related to the degree to which shippers specify the transport-related criteria in detail or leave them to transport providers or whether both actors jointly specify the criteria.	Paper I
How is climate performance realised despite different organisational goals in relation to transport performance?	It was found that the reaching out to customers to consolidate deliveries is important in satisfying several goals related to transport performance such as climate performance, good service and cost reduction. The findings also show that the specification of transport planning criteria (based on which transport managers have to plan transport activities) at managerial levels above the Transport function and designing transport performance metrics aligned with the planning criteria are important in managing a multiple-goal transport performance system.	Paper II
How is climate alignment with transport providers and customers ensured in the procurement of transport services?	The findings show that climate commitment is considered when the requirements on transport services are specified for transport providers. It was also found that climate performance is taken into account in the selection of transport providers. The findings also indicate that climate- related requirements are explicitly contracted for transport providers. It was noted that climate commitment is considered when transport providers are called to carry out transport and finally climate commitment is on the agenda when evaluating transport providers' performance. When it comes to customers, the empirical data indicate that climate commitment is realised in the ordering step of transport procurement process when customers' ordering patterns are managed to realise the climate commitment.	Paper III

4.2. Empirical data from papers

In this subsection, the empirical data from papers are elaborated more in detail that are the basis for the findings presented in Table 4.

4.2.1. Empirical data from Paper I

Paper I entitled 'Importance of context when specifying transport service' has the following research question:

What is the influence of contextual factors on the actors' involvement in specifying transport-related criteria?

The empirical data from paper I are presented in this subsection that indicate that contextual factors are related to the degree to which shippers specify the transport-related criteria in detail or leave them to transport providers or whether both actors, jointly, specify the criteria.

Industry

Shippers in the primary and food industries specify vehicles and equipment more in detail compared to shippers in the engineering industry.

Size of shippers' organisation

Shippers with 100 - 200 employees are more involved in joint specification of vehicles and equipment compared to shippers with more than 200 employees.

Profession

When logistics or transport managers are responsible for the procurement of transport services, shippers are more involved in the specification of subcontractor, work instructions and transport time in detail.

Purchase task

Correlations were observed between larger and longer transport contracts and shippers' involvement in specifying subcontractors in detail. A correlation was also observed between large transport contracts and joint specification of time precision by shippers and transport providers.

Service type

A correlation between more complicated service type (larger variation in location of recipients) and joint specification of resources (vehicles and equipment).

4.2.2. Empirical data from Paper II

Paper II entitled 'What does it take to reduce CO_2 emissions in a multiple-goal transport performance system?' has the following research question:

How is climate performance realised despite different organisational goals in relation to transport performance?

Empirical data from paper II are presented in this subsection that show how climate performance is realised despite different organisational goals in relation to transport performance.

Reaching out to customers

It was found that a cross-functional initiative between the Transport function and the Sales function to reach out to customers with the aim of consolidating deliveries reduces the conflict between time-related transport planning criteria and climate performance. This initiative is run with the support of management at upper organisational hierarchies to increase resource efficiency and to decrease CO_2 emissions. This initiative satisfies several goals related to transport performance such as climate performance, good service and cost reduction.

Specification of transport planning criteria at managerial levels above the Transport function

The findings show that the specification of transport planning criteria (based on which transport managers have to plan transport activities) at managerial levels above the Transport function is important in managing a multiple-goal transport performance system. The findings show that the specification of transport planning criteria at managerial levels above the Transport function, specify game rules between the Transport function and the Sales function and foster coordination between the peer functions when it comes to the planning for transport activities for procured transport services.

Designing transport performance metrics aligned with the transport planning criteria

The findings of paper II indicate that design of transport performance metrics in accordance with transport planning criteria ensures that transport managers responsible for the procurement of transport services plan transport activities in accordance to transport planning criteria.

4.2.3. Empirical data from Paper III

Paper III entitled 'Climate alignment with transport providers and customers in the procurement of transport services' has the following research question:

How is climate alignment with transport providers and customers ensured in the procurement of transport services?

Empirical data from paper III are presented in this subsection that show how climate alignment with transport providers and customers is ensured in the procurement of transport services.

The empirical data from Paper III show that climate-related requirements on transport services are specified and articulated in the transport contract with transport providers. These requirements are use of renewable fuels, use of high euro class engine and drivers' eco-driving. It was also found that the result of evaluation of transport providers' climate performance is used in the next tendering process that results in renewing contract with many transport providers and ending contracts with a few. The findings show that routes for transport providers are optimised when they are called to carry out transport. CO_2 emissions data are collected from transport providers and transport providers' performance is monitored and evaluated. The findings of Paper III also show that deliveries to customers are consolidated through adjusting delivery schedules.

5. Analysis and discussion

This thesis explores how organisational climate commitment can be realised in the procurement of transport services. In this section, first the main findings of the papers are discussed based on the model of analysis (Figure 3) and the answers to research questions of the thesis are presented in Table 5. After providing answers to research questions, a conceptual analysis on the influence of context on the realisation of climate commitment in the procurement of

transport services is presented that draws on the frame of reference and the findings of the thesis.

5.1. Influence of context on the specification of transport services

The findings of paper I illustrates that there is a correlation between several contextual factors and the specification of transport-related criteria (i.e., transport time, time precision, mode of transport, subcontractor, vehicles and equipment and work instruction). For example, it was found that shippers adapt the level (i.e., the degree to which they specify) and type (i.e., which transport-related criteria) of their involvement in the specification of transport-related criteria to industry they are part of that is in line with previous research (Johnson et al., 2002). It was also noted that size of shippers' organisation influence the level and type of shippers' involvement in the specification of transport-related criteria that is supported by previous research (Holter et al., 2008).

5.2. Shippers' realisation of climate commitment

In this subsection, the findings of papers II and III which were presented in Table 4 are discussed.

Outward realisation of climate commitment

Paper III shows that dependency on transport providers related to the transport activity is managed through managerial practices to realise climate commitment in the procurement of transport services. These managerial practices ensure alignment with transport providers on climate performance by:

- Standardisation of work i.e., the specification of climate-related criteria for transport providers, articulating them in transport contracts, optimalisation of routes for transport providers (cf. Mintzberg, 1989) and,
- Standardisation of output i.e., using the results of transport providers' evaluation in the tendering process, collecting CO_2 emissions data from transport providers and monitoring and evaluating transport providers' climate performance (cf. Mintzberg, 1989).

The findings of papers II and III also show that deliveries to customers are consolidated by adjusting the delivery schedules which implies that the dependency on customers related to the transport activity is managed to realise climate commitment in the procurement of transport services. Adjusting delivery schedules with customers is a managerial practice aiming at alignment with customers on climate performance by mutual adjustment (cf. Mintzberg, 1989). Consolidating deliveries enables higher resource utilisation that results both in the reduction of CO_2 emissions and costs. This is an important step in creating compatibility between transport performance metrics of service, cost and CO_2 emissions (cf. Caplice and Sheffi, 1995).

Inwards realisation of climate commitment

The findings of paper II show that when transport planning criteria are specified at upper managerial levels for the Transport function (the responsible function for the procurement of transport services) the performance metrics are vertically aligned, i.e., they mirror overall organisational strategy (cf. Hanson et al., 2011; Caplice and Sheffi, 1995). It is also important that transport performance metrics are aligned with the transport planning criteria, because there is otherwise a risk that transport managers plan transport activities based on their own perception of transport planning criteria (cf. Hanson et al., 2011). The findings also show that the specification of transport planning criteria at higher managerial level foster interfunctional coordination between the Transport function and the Sales function in the planning of transport

activities because it makes the game rules clear for the peer functions (cf., Caplice and Sheffi., 1995).

5.3. Connection of findings to the model of analysis

The findings of the papers are connected to the model of analysis (see Figure 3) in this subsection (cf. subsection 2.4). The purpose of this thesis was to explore how organisational climate commitment can be realised in the procurement of transport services. This purpose was broken down into the following two research questions:

RQ_1: How do contextual factors influence shippers' procurement of transport services?

RQ_2: What does shippers' climate commitment imply for transport procurement?

To address these research questions, it was necessary to define contextual factors, procurement of transport services and shippers' realisation of climate commitment. Previous research was explored and presented in subsections 2.3, 2.1 and 2.2 to define contextual factors, procurement of transport services and shippers' realisation of climate commitment, respectively. Transport procurement process (subsection 2.1) was used in this thesis to enable a systemfic inquiry into research questions.

Starting from the contextual factors, this thesis studied the influence of industry, size of shippers' organisation, profession, buying organisation, service type, purchase task and importance of transport (see subsection 2.3) on the procurement of transport services that was limited to the specification of transport-related criteria. Empirical data from Paper I indicate correlation between the specification of transport-related criteria with all contextual factors except importance of transport and buying organisation (see Figure 6). It was not possible, based on theory, to establish causality links with certainty for all observed correlations between contextual factors and the specification of transport-related criteria in Paper I because of the nature of the Survey Study. Therefore, the one-way arrow in Figure 3 suggesting the influence of context on the transport procurement process is changed to two-way arrow suggesting correlation between dependent and independent variables (see Figure 6).

As was noted in subsection 2.2, the realisation of climate commitment implies both outward and inward managerial practices in the organisation. Outward managerial practices aim at alignment with transport providers and customers on climate performance. In this thesis, it was assumed that shippers ensure the alignment with their transport providers and customers on climate performance by mutual adjustment, direct supervision, standardisation of work, standardisation of output, standardisation of skills and standardisation of norms (see subsection 2.2). The findings of Paper III provide empirical support for alignment with transport providers by standardisation of work and standardisation of output. The findings of Paper III also show the empirical support for alignment with customers by mutual adjustment (see Figure 6).

It was assumed in this thesis that inward managerial practices aim at adapting transport performance system to the climate commitment that in turn implied that the realisation of climate commitment is contingent on the realisation of several characteristics of transport performance metrics (see subsection 2.2). This means that transport performance metrics need to be vertically aligned, horizontally coordinated, comprehensive, useful, casually oriented, and useful. The findings of Paper II provide empirical support for all these characteristics of transport performance systems (see Figure 6).

Figure 6 illustrates the result of the model of analysis (cf. Figure 3) based on the findings of papers. It is worth noting that the empirical support found in papers (written in *italic* in Figure 6) can be context specific. However, they are instrumental in supporting the theoretical assumptions of the thesis that are highlighted in ***bold italic*** in Figure 6.

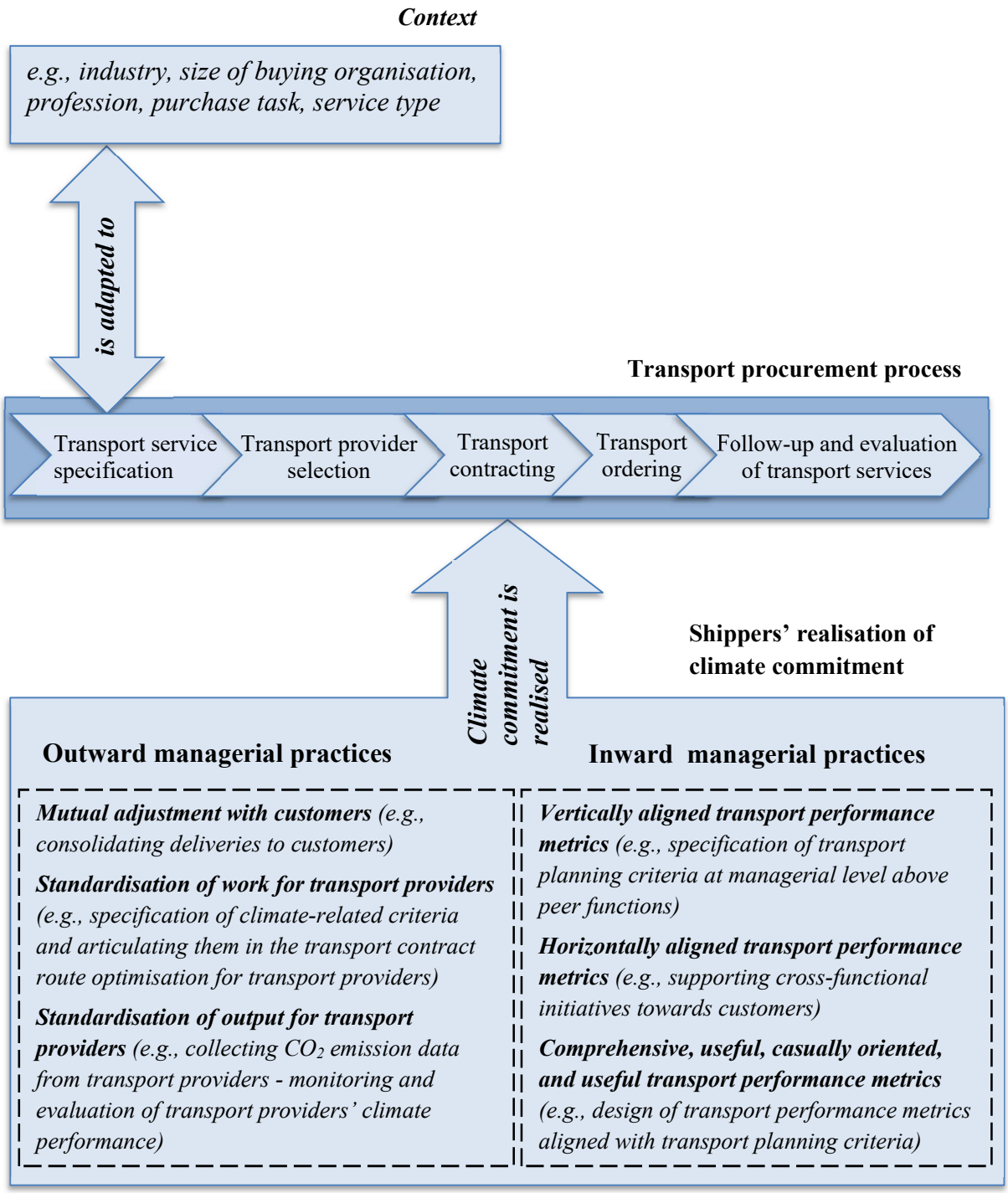

Figure 6. Findings of papers connected to the model of analysis

As shown in Figure 6, climate commitment is realised through both outwards managerial practices towards transport providers and customers that aim at ensuring alignment with them on climate performance and inwards managerial practices that are centred around the adapting transport performance system to the climate performance. It is also shown that shippers adapt the specification of transport-related criteria to the context in which they operate. Based on the findings of papers, the answers to research questions are presented in Table 5.

Table 5. Answers to research questions

Research question	Answer
RQ1: How do contextual factors influence shippers' procurement of transport services?	Shippers adapt the level (i.e., the degree to which they specify) and type (i.e., which transport-related criteria) of their involvement in the specification of transport-related criteria to the context in which they operate.
RQ_2: What does shippers' climate commitment imply for transport procurement?	To ensure alignment with transport providers and customers on climate performance. To adapt the transport performance system to climate commitment.

5.4. Conceptual analysis on the influence of context on the realisation of climate commitment

The findings of Paper I indicate that shippers in the domain of the thesis (Sweden) adapt the level and type of their involvement in the specification of transport-related criteria (e.g., transport time) to context in which they operate. For example, a correlation was found between shippers' specifying resources (subcontractors) and longer or larger transport contracts that suggest that shippers need to offer longer or larger contracts to transport providers' when they need to specify resources that transport providers use (cf. Gadde and Wynstra, 2018). Another example is that there is a correlation between large transport contracts and joint specification of time precision. This might be an indicator of shippers' need for more coordination efforts in the supply chain when they have large transport contracts that warrants joint specification of output-oriented transport criteria. While the Survey Study does not provide insight into the motivation of shippers in joint specification of time precision with transport providers but from the previous research it is inferred that joint specification of time precision with transport providers (compared to shippers' specification in detail) is expected to improve resource efficiency (Hedvall et al., 2017).

According to Caplice and Sheffi (1995) context influences logistics performance. Based on the studies conducted in this thesis, it is not possible to explore motivation of shippers in the specification of transport-related criteria such as transport time and time precision or the connection between the specification of these criteria and climate performance of transport. However, it is expected that the specification of transport time or time precision when they are motivated by adaption to contextual factors (and not by climate commitment) adds new dimension to climate performance of transport. This new dimension either imposes new burden on the system that makes it challenging to maintain its balance or on the contrary, facilitates its balance (cf. Caplice and Sheffi, 1995).

For example, it is noted that shippers in primary and food industries are more involved in specifying vehicles and equipment. It can be argued that shippers in these industries more specify vehicles and equipment because of the regulations about transport in these industries (see Rogerson et al., 2012; Johnson et al., 2002). The involvement can have adverse effects on the efficiency of transport as it might constrain transport providers from utilising their vehicles and equipment in an optimal way (see Jazairy 2020; Hedvall et al, 2017; Andersson and Norrman, 2002). This issue can have consequences for shippers' decarbonisation strategies within logistics and the climate performance because shippers, despite their willingness to

reduce CO_2 emissions, have to comply with regulations. It can be argued that contextual factors affect the climate performance of shippers and that they can have moderating effects on shippers' realisation of their climate commitment in the procurement of transport services.

6. Conclusion

This thesis explores how organisational climate commitment can be realised in the procurement of transport services. The findings indicate that the realisation of climate commitment in the procurement of transport services implies that the transport procurement is managed in relation to the transport providers and customers to ensure alignment on the climate performance. This is achieved by outward managerial practices towards transport providers such as the specification of climate-related criteria and the monitoring and evaluating the transport providers' climate performance that ensure alignment on the climate performance by standardisation of work and output respectively. When it comes to the customers, alignment is ensured by mutual adjustment through for example, consolidating deliveries to the customers.

It was also found that the realisation of the climate commitment implies that transport performance system is adapted to the climate commitment. This means that transport performance metrics need to be vertically aligned (i.e., transport planners mirror the organisation's overall goals and strategies), horizontally coordinated (i.e., transport performance metrics include all functions involved in the procurement of transport services), comprehensive (i.e., include all stakeholders in transport performance), useful (i.e., easy to understand), comparable (i.e., enables trade-offs), and causally oriented (i.e., considers future performance).

It was found that shippers adapt the level (i.e., the degree to which they specify) and type (i.e., which transport-related criteria) of their involvement in the specification of transport-related criteria to context they operate in. Adaptation to the context can facilitate or constrain shippers' outward or inward managerial practices in the realisation of their climate commitment. The findings of this thesis suggest that contextual factors have moderating effects on shippers' realisation of climate commitment in the procurement of transport services and therefore, it is important that their effects are understood in relation to the developing of shippers' decarbonisation strategies. This is left for future research.

Previous research has overlooked the link between transport procurement and the realisation of organisational goals within and across the organisation. This thesis expands the scope of transport procurement literature and connects the procurement of transport services to managerial levels above the Transport function where organisational strategies and goals are formulated that is an important contribution of the thesis. For example, while previous research emphasise the role of shippers' intraorganisational alignment in the transition towards fossil-free freight transport systems, the findings of this thesis, provides insight into how intraorganisational alignment can be achieved e.g., by the specification of transport planning criteria at managerial levels above the peer functions involved in the procurement of transport services.

References

Andersson, D., Dubois, A., Eriksson V., Hulthén, K. and Holma, Anne-Maria. (2019), 'The transport service triad: a key unit of analysis', *Journal of Business and Industrial Marketing,* 34(1), pp. 253-266.

Andersson, D. and Norrman, A. (2002), 'Procurement of logistics services - a minutes work or a multiple year project?, *European Journal of Purchasing and Supply Management,* 8(1), pp. 3-14.

Axelsson, B. and Wynstra, F. (2002), '*Buying business Services'.* West Sussex: John Wiley and Sons Ltd.

Bask, A. and Rajahonka, M. (2017), 'The role of environmental sustainability in the freight transport mode choice A systematic literature review with focus', *International Journal of Physical Distribution and Logistics Management,* 47(7), pp. 560-602.

Bask, A., Rajahonka, M., Laari, S., Solakivi T., Töyli, J., Ojala L (2018), 'Environmental sustainability in shipper-LSP relationships', *Journal of Cleaner Production*, 172, pp. 2986-2998.

Björklund, M. (2011), ' Influence from the business environment on environmental purchasing - Drivers and hinders of purchasing green transportation services', *Journal of Purchasing and Supply Management,* 17(1), pp. 11-22.

Björklund, M. (2005). '*Purchasing Practices of Environmentally Preferable Transport Services, Guidance to increased shipper considerations.PhD dissertation',* Lund University.

Björklund, M. and Forslund, H. (2013), 'The inclusion of environmental performance in transport contracts', *Management of Environmental Quality: An International Journal,* 24(2), pp. 214-227.

Boyer, K. K. and Pagell, M. (2000), 'Measurement issues in empirical research: improving measures of operations strategy and advanced manufacturing technology'. *Journal of Operations Management,* 18(3), pp. 361-374.

Caplice, C. and Sheffi, Y. (1995), 'A review and evaluation of logistics performance measuremen systems', *The International Journal of Logistics Management,* 6(1), pp. 61-74.

Delmas, M. and Toffel, M. W. (2004), 'Stakeholders and Environmental Management Practices: An Institutional Framework', *Business Strategy and the Environment,* 13(4), pp. 209-222.

Easton, G. (2010), 'Critical realism in case study research', *Industrial Marketing Management,* 39(1), pp. 118-128.

Ellram, L. M. and Golicic, S. L. (2015), 'Adopting Environmental Transportation Practices', *Transportation Journal,* 54(1), pp. 55-88.

Ellram, L. M. and Golicic, S. L. (2016), 'The role of legitimacy in pursuing environmentally responsible transportation practices', *Journal of Cleaner Production,* 139(15), pp. 597-611.

Eriksson, V., Hulthén, K. and Pedersen, A.-C. (2021), 'Improving transport performance in supply networks: effects of (non)overlapping network horizons', *Journal of Business & Industrial Marketing*, 36 (10), pp. 1767-1779

European Commission (2017), '*An Overview of the EU road transport market',* European Commission.

Flyvbjerg, B. (2006), 'Five misunderstandings about case-study research', *Qualitative Inquiry*, 12(2), pp. 219-245

Forslund, H., Björklund, M. and Ülgen, V. S. (2021), 'Challenges in extending sustainability across a transport supply chain', *Supply Chain Management: An International Journa,* 27(7), pp. 1-16.

Forza, C. (2002), 'Survey research in opearions managment: a process-based perspective', *International journal of operations and production management,* 22(2), pp. 152-194.

Frankel, R., Naslund, D. and Bolumole, Y. (2005), 'The "white space" of logistics research: A look at the role of methods usage', *Journal of Business Logistics*, 26(2), pp. 185-209

Gadde, L.-E. and Wynstra, F. (2018), 'Purchasing management and the role of uncertainty', *IMP Journal,* 12(1), pp. 127-147.

Gattorna, J. (2016), '*Strategic supply chain alignment',* New York, Routledge

Glock, C. H. and Hochrein, S. (2011), 'Purchasing Organization and Design: A Literature Review', *Business Research,* Vol. 4, pp. 149-191.

Haglund, P. (2022), '*Logistics Strategy for Building Contractors Context, Content, and Process.* Licentiate Thesis', Linköping: Linköping university .

Halldórsson, Á. and Aastrup, J. (2003), 'Quality criteria for qualitative inquiries in logistics', *European Journal of Operational Research,* 144(2), pp. 321-332.

Hedvall, K., A. Dubois, and Lind., F. (2017), 'Variety in freight transport service procurement approaches.', *Transportation Research Procedia* 25: 806-823.

Holter, A. R., D. B. Grant, J. Ritchie, and Shaw, N. (2008), 'A framework for purchasing transport services in small and medium size enterprises.' International Journal of Physical Distribution & Logistics Management 38 (1): 21-38.

Hanson, J.D., Melnyk, S.A. and Calantone, R.A. (2011), 'Defining and measuring alignment in performance management', *International Journal of Operations & Production Management*, 31 (10), pp. 1089-1114

Houlihan, J. B. (1985). 'International Supply Chain Management', *International Journal of Physical Distribution and Materials Management,* 15(1), pp. 22-38.

Huge-Brodin, M., Sweeney, E. and Evangelista, P. (2020), 'Environmental alignment between logistics service providers and shippers - a supply chain perspective', *The International Journal of Logistics Management,* 31(3), pp. 575-605.

Isaksson, M. P., Hulthén, H. and Forslund, H. (2019), 'Environmentally Sustainable Logistics Performance Management Process Integration between Buyers and 3PLs', *Sustainability,* Vol. 11, pp. 1-19.

Johnston, W. and Lewin, E. J. (1996), 'Organizational buying behavior: Toward an integrative framework', *Journal of Business Research,* 35(1), pp. 1-15.

Johnson, P. F., R. D. Klassen, M. R. Leenders, and Fearon. H. E. (2002), 'Determinants of purchasing team usage in the supply chain.' Journal of Operations Management 20 (1): 77-89.

Jazairy, A. (2020), 'Aligning the purchase of green logistics practices between shippers and logistics service providers' , *Transportation Research Part D,* Vol. 82, p. 102305.

Jazairy, A. and Haartman, R. V. (2020), 'Analysing the institutional pressures on shippers and logistics service providers to implement green supply chain management practices', *International Journal of Logistics Research and Applications,* 23(1), pp. 44-84.

Jazairy, A. and Haartman, R. V. (2021), 'Measuring the gaps between shippers and logistics service providers on green logistics throughout the logistics purchasing process', *International Journal of Physical Distribution and Logistics Managemen,* 51(1), pp. 25-47.

Jørsfeldt, L. M., Hvolby, H.-H. and Nguyen, V. T. (2016), 'Implementing environmental sustainability in logistics operations: a case study', *Strategic Outsourcing: An International Journal,* 9(2), pp. 98-125.

McKinnon, A. (218), *Decarbonizing Logistics,* Kogan Page Ltd.

McKinnon, A. M. (2016), 'Freight Transport Deceleration: Its Possible Contribution to the Decarbonisation of Logistics', *Transport Reviews,* 36(4), pp. 418-436.

Kraljic, P. (1983), 'Purchasing Must Become Supply Management', *Harward Business Review*, September.

Lenton, T. M., Rockström, J., Gaffney, O., Rahmstorf, S., Richardson, K., Steffen., W. and Schellnhuber, H. J. (2019), 'Climate tipping points - too risky to bet against', *Nature*, 27 November, pp. 592-595 .

Levy, D. and Rothenberg, S. (2002), 'Heterogeneity and change in environmental strategy: Technological and political responses to climate change in the global automobile industry'. in: *Organizations, Policy and the Natural Environment: Institutional and Strategic Perspectives.* Stanford: CA: Stanford University Press, pp. 173-193.

Liljestrand, K., Christopher, M. and Andersson, D. (2015), 'Using a transport portfolio framework to reduce carbon footprint', *The International Journal of Logistics Management,* 26(2), pp. 296-312.

Liu, H., Ke, W., Wei, k.k., Gu, J. and Chen, H. (2010), 'The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems, *Journal of Operations Management,* 28(5), pp. 372-384.

Martinsen, U. and Björklund, M. (2012), ’Matches and gaps in the green logistics market’, *International Journal of Physical Distribution and Logistics Management,* 42(6), pp. 562-583.

Martinsen, U. and Huge-Brodin, M. (2014), ‘Environmental practices as offerings and requirements on the logistics market’, *Logistics Research,* 7(115), pp. 1-22.

McIntyre, K., Smith, H. A., Henham, A., and Pretlove, J. (1998), 'logistics performance measurement and greening supply chain: diverging mindsets'. *The International Journal of Logistics Management,* 9(1), pp. 57-68.

Melnyk, S. A., Stewart, D. M. and Swink, M. (2004), ‘Metrics and performance measurement in operations management: dealing with the metrics maze’, *Journal of Operations Management,* 22(3), pp. 209-218.

Mintzberg, H. (1989), Mintzberg on Management: Inside Our Strange World of Organizations, *The Free Press*, New York, NY

Ries J.M., Grosse E. H., Fichtinger J. (2017), ‘Environmental impact of warehousing; a scenario analysis for the United States’, *International journal of Production Research*, 55(21), pp. 6485-6499.

Rogerson, S. (2016), ‘*Doktoral thesis: Environmental concerns when purchasing freight transport’,* Gothunberg : Chalmers university of technology.

Rogerson, S., Andersson, D. and I. Johansson, M. (2014), ‘Influence of context on the purchasing process for freight transport services’, *International Journal of Logistics Research and Applciations,* 17(3), pp. 232-248.

Rogerson, S. and Sallnäs, U. (2017), ‘Internal coordination to enable high load factor’, *The International Journal of Logistics Management,* 28(4), pp. 1142-1167.

Rogerson, S., D. Andersson, and Johansson M. (2012), ‘Sustainable freight transport purchasing’, Proceedings of the 21th Annual IPSERA Conference, Naples, April 2012 Sustainable freight transport purchasing

Sallnäs, U. (2016), ‘Coordination to manage dependencies between logistics service providers and shippers An environmental perspective’, *International Journal of Physical Distribution and Logistics Management,* 46(3), pp. 316-340.

Sayer, A., (2000), ‘Realism and social science’, London: Sage

Touratier-Muller, N. and Ortas, E. (2021), ‘Factors driving shippers’ compliance with a voluntary sustainable freight programme in France’, *Journal of Cleaner Production,* Volym 318, 128397.

Transport Purchasing Panel, 2022. Transport Purchasing Panel. [Online] Available at: https://www.chalmers.se/en/centres/lead/TransportPurchasingPanel/Pages/default.aspx [used 29 12 2022].

Voss, C., Tsikriktsis, N. and Frohlich, M. (2002), ‘Case research in operations management’, *International Journal of Operations and Production Management,* 22(2), pp. 195-219.

Weele, A. J. v. and Raaij, E. M. v. (2014), ‘The Future of Purchasing and Supply Management Research: About Relevance and Rigor’, *Journal of supply chain management ,* 50(1), pp. 56-72.

Weele, A. v. and Rozemeijer, F. (2022), ‘*Procurement and supplcy chain management’,* Cengage Learning EMEA.

Wolf, C. and Seuring, S. (2010), ‘Environmental impacts as buying criteria for third party logistical services’, *International Journal of Physical Distribution and Logistics Management,* 40(1/2), pp. . 84-102.

Wong, C., Skipworth, H., Godsell, J. and Achimugu, N., (2012), ‘Towards a theory of supply chain alignment enablers: a systematic literature review’, *Supply Chain Management,* 17(4), pp. 419-437.