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## **How to align logistics environmental sustainability with corporate strategy? An Italian perspective**

### **Abstract**

Logistics environmental sustainability is a priority for practitioners and policymakers, but companies lack clarity about how to align it with strategic purposes. As this prevents them from coherently turning sustainability into action, this paper focuses on how companies can align logistics environmental sustainability with corporate strategies.

We conducted multiple embedded case research involving logistics service providers (LSPs) and shippers operating in the Italian context. We selected 13 companies (6 LSPs and 7 shippers) and conducted semi-structured interviews to contextualize and elaborate the extant theory.

Results highlight that companies seem more motivated by the need to comply with regulations or to protect their environmental reputation, rather than by a genuine understanding of the actual need for sustainability. A framework is proposed to foster the alignment of logistics environmental sustainability with corporate strategy, underpinned by five main dimensions: degree of awareness, degree of formalisation, measurements systems, governance and accountability, and budget allocation.

**Keywords:** Logistics; environmental sustainability; corporate strategy; strategic alignment

**Paper type:** Application paper

## Introduction

If contemporary planetary conditions are significantly different from preceding millennia, mankind has played a central role in shaping them (Rockström, 2020; Morrell and Dahmann, 2022). Human activities involve a constellation of actors, institutions, and networks, which determine and constitute modern supply chains (Wieland, 2021). Supply chains activities have a considerable impact on the environment (McKinnon, 2018; Sarkis, 2021), and companies are thus called to quickly reduce supply chains' environmental impact which is often related to greenhouse gas (GHG) emissions (Abbasi and Nilsson, 2016). Among the many activities incurred along supply chains, logistics accounts for 13% of the overall GHG emissions worldwide (Perotti et al., 2022) and this is exacerbated by the steady growth of the demand for ecommerce services in the last few years (Creazza et al., 2023). As logistics importance is rising sharply (Prataviera et al., 2021), addressing logistics environmental sustainability is a huge concern for practitioners and policymakers (Evangelista et al., 2018; Hüge-Brodin et al., 2020).

Reflecting the importance of the problem for practitioners, supply chain sustainability gained increased attention also among academics (Meixell and Luoma, 2015; Ansari and Kant, 2017). The urgency of the climate crisis shed a light on the environmental sustainability for logistics operations (Centobelli et al., 2020; Shaw et al., 2021) and the related academic literature has grown rapidly (Singh and Trivedi, 2016; Giuffrida and Mangiaracina, 2020). Logistics environmental sustainability is also referred to as "green logistics" (Jazairy, 2020) and aims to mitigate the environmental externalities of logistics functions (Dekker et al., 2012). Principles of green logistics have been formalised (McKinnon et al., 2015; Abbasi and Nilsson, 2016), and many green logistics practices (GLPs) have been developed to mitigate the impact on the natural environment (Evangelista et al., 2017). However, green logistics has the potential to become an important industrial outlook in terms of contribution to the development of the sustainability corporate strategy of organisations (Martinsen and Bjorklund, 2012; Negri et al., 2021). Sustainable practices need to be aligned with the corporate strategy to be effective (e.g., Etzion, 2007; Del Baldo, 2010) and corporate strategies need to include sustainability considerations in decision-making (Labuschagne et al., 2005). The alignment of sustainability with corporate strategies can lead to enhanced sustainable competitive advantage and long-term business development of firms (Schrettle et al., 2014; Le, 2022). The literature supports the view according to which the effectiveness of sustainability actions can be enhanced by closely aligning sustainability strategies with corporate strategies (Cavalieri and Shabana, 2018), which supports long-term sustainability success (van Zanten and van Tulder, 2021).

However, companies struggle with aligning green logistics with corporate strategies (Del Baldo, 2010; Kazancoglu et al., 2021), as corporate objectives seem often to be driven by profits rather than environmental sustainability (Wieland, 2021). In broader terms, environmental sustainability is characterised by an "understanding into action conundrum" (Sweeney et al., 2018), as "there is a clear understanding of what should be done and why but less clarity in terms of how to go about it" (Hüge-Brodin et al., 2020; p. 599).

When narrowing the scope on logistics, companies need to develop innovative approaches that contribute to coherently turn sustainability into practice (Abbasi and Nilsson, 2016) but they lack clarity about how to align green logistics with their strategic purposes (Laari et al., 2018). Moreover, aligning green logistics with corporate strategies can strengthen and foster GLPs adoption (Evangelista et al., 2017). This, in turn, can contribute to the improvement of organisations' sustainability and lead to better firm performance (Golicic and Smith, 2013; Seroka-Stolka, 2014). We thus formulated the following RQ:

***How do companies align logistics environmental sustainability with corporate strategy to foster the adoption of GLPs?***

Logistics systems include a variety of actors, characterised by individual strategic goals and priorities (Jazairy, 2020). Among the various actors involved, logistics service providers (LSPs) and shippers (typically retailers and manufacturers, i.e., the customers of LSPs) are key players (Huge-Brodin et al., 2020). Previous studies mainly examined green logistics by considering LSPs (Abbasi and Nilsson, 2016; Evangelista et al., 2017). However, green logistics can also be developed by shippers, which could be characterised by different strategic purposes than LSPs (Jazairy et al., 2021). We conducted multiple embedded case studies (Yin, 2014) examining both LSPs and shippers who acknowledged green logistics as a current strategic priority or a key prospect for the immediate future (Evangelista et al., 2017). We also limited our investigation to the Italian context, as Italy is one of the European countries with the highest traffic volumes and forecasts suggest a further increase in logistics activities in the next few years (Prataviera et al. 2021).

From an academic perspective, this study reviews previous contributions and contextualises empirical insights to elaborate the extant theory and improve our understanding about how to align environmental sustainability with corporate strategies in the logistics industry. A framework is proposed to describe this alignment underpinned by five main dimensions: degree of awareness, degree of formalisation, measurements systems, governance and accountability, and budget allocation. Different stages of alignment are also identified, providing practitioners with insights about how they could foster the alignment between corporate targets and pragmatic actions and thus support the adoption of green logistics principles and practices.

The paper proceeds as follows. The literature review is first presented, followed by the methodology illustration and the findings' description. Results are then discussed and conclusions are drawn along with suggestions for future research avenues.

## Literature review

### *Green supply chain management*

In the wider context of sustainability, green supply chain management encompasses the explicit consideration of the ecological dimensions in the management of supply chain operations, resources, information, and capital to enhance the competitive advantage of a supply chain (Carter and Rogers, 2008; Negri et al., 2021). Green supply chain management aims not only to reduce the negative impact generated by traditional supply chain activities but also to introduce initiatives that decrease pollution into each supply chain stage (Abukhader and Jönson, 2004; Fahimnia et al., 2015; Li and Huang, 2017). Scholars focused on heterogeneous problems like the consideration of product life cycle during materials selection, the impact of purchasing activities on focal companies' environmental performance, waste management, packaging design, and compliance to government regulations (Giunipero et al., 2012; Martensson and Westerberg, 2016; Negri et al., 2021).

Even though environmental consciousness is regarded as highly relevant, the main obstacle for successful adoption of green supply chain management is the perception of incompatibility between efficiency and sustainable initiatives (García-Arca et al., 2014; Kazancoglu et al., 2021). The issue of cost is predominant for companies (Abbasi and Nilsson, 2012; Shaw et al., 2021) also because customers are not always willing to pay higher prices for green products and services (Colicchia et al., 2013; Hüge-Brodin et al., 2020; Dai et al., 2021). Therefore, a key challenge is determining the "right" investment (Seuring and Müller, 2008; García-Arca et al., 2014). Despite many companies have been working on quick wins and light-touch interventions, future actions require major investment commitments, increasing the pressure for companies to adopt practices that can both enhance the environmental performance and at the same time improve the economic bottom line (Carter and Rogers, 2008; Shaw et al., 2021).

### *Green logistics practices (GLPs)*

If green supply chain management is the integration of environmental concerns within supply chain management (Carter and Rogers, 2008; Fahimnia et al., 2015), a significant proportion of supply chain environmental impact is generated from logistics operations (Kazancoglu et al., 2021). Green logistics concerns the study of the environmental effects of all the activities involved in the transport, storage and handling of physical products as they move through supply chains in both forward and reverse directions (McKinnon et al., 2015). Therefore, green logistics aims to reduce CO<sub>2</sub> emissions, noise, and waste (Dekker et al., 2012; Centobelli et al., 2017).

Previous studies formalised the principles of green logistics (Abbasi and Nilsson, 2016) and the term "green logistics practices" (GLPs) describes a variety of logistics-related initiatives implemented by organisations to reduce their impact on the natural environment (Evangelista et al., 2017). Thanks to the increasing importance acknowledged to logistics when pursuing environmental sustainability, many GLPs have been

adopted in recent years to reduce supply chains' carbon footprint (Huge-Brodin et al., 2020). To provide an organic overview of the GLPs and consolidate the existing practices, scholars often categorised them into taxonomies (e.g., Perotti et al., 2012; Colicchia et al., 2013). Key areas of GLPs include transportation planning and execution, fuel decarbonisation, green warehousing, reverse logistics, eco-design and packaging management, internal management, collaboration with customers, collaboration with suppliers, and external collaborations (Lieb and Lieb, 2010; Centobelli et al., 2017; Evangelista et al., 2017; Osman et al., 2022). GLPs also include modal shift and intermodal solutions (McKinnon, 2018; Laguir et al., 2021), network re-design (Aronsson and Huge-Brodin, 2006; Jazairy et al., 2021), shipment and freight consolidation (Colicchia et al., 2013); use of tools to improve carbon footprint assessment (Lieb and Lieb, 2010; Piecyk and Bjorklund, 2015). However, it appears that the actual adoption of these practices is taking place at a relatively slow pace (Huge-Brodin et al., 2020).

Although GLPs adoption is mostly left on LSPs' shoulders (Colicchia et al., 2013; Evangelista et al., 2019), different actors are needed and can be deemed accountable for GLPs development (Jazairy et al., 2021). LSPs are players able to arrange complex solutions for door-to-door shipments, optimizing the route travelled and by selecting the most suitable transportation mode (or combination of means), and warehousing solutions (Prataviera et al., 2021). However, LSPs' implementation of GLPs is to a large extent dependent on the relationships formed with, and the actions made by, shippers (i.e., buyers of logistics services) (Huge-Brodin et al., 2020). Shippers usually don't own the physical logistics assets (necessary for transportation or storage) and rely on LSPs or freight forwarders for logistics planning and execution (Rjahonka & Bask, 2016; Jazairy, 2020). As illustrated by Jazairy and von Haartman (2019), both LSP and shippers are subject to institutional pressures to adopt green supply chain management practices, which could drive shippers to purchase green logistics services from LSPs, and LSPs to provide them. Shippers are then usually distinguished between manufacturers and retailers. Manufacturers are the producers of physical products to be distributed to final consumers directly or via intermediaries, like retailers who buys from upstream players in the chain and serve directly final consumers (Jazairy and von Haartman, 2021).

### *GLPs adoption*

The adoption of GLPs can be influenced by multiple factors, which may accelerate or jeopardise GLPs implementation (Marchet et al., 2014). Organisational factors are important elements that concern companies' culture and internal management, and directly affect human resources and their willingness and capability to develop green initiatives (Abbasi and Nilsson, 2016). First, management and employees must be engaged with green development, as this determines internal resistance or support to changes (Seuring and Muller, 2008; Abbasi and Nilsson, 2012; Forslund et al., 2021). People's engagement fosters the effective management of new projects and reduces the time needed for their implementation (Rossi et al., 2013). In

its absence, management, and employees prioritise other scopes and let green initiatives at the bottom of their agenda (Evangelista et al., 2017).

However, complexity of the decision-making processes can play a key role (Seuring and Muller, 2008). Some multinational companies need a lot of approval steps to even start discussing new projects and investments (Laari et al., 2018). They need to be revised by different functions, and the different debated modifications could extend the time for approval to years. This is critical when breakthrough technologies are discussed, as those technologies are often subject to frequent updates (Centobelli et al., 2017). If this process is too long once the initiative is approved it might already be obsolete, thus companies should design efficient and as-expedite-as-possible decisional processes (Abbasi and Nilsson, 2016; Centobelli et al., 2020). Moreover, once a GLP had been approved by the management, a feasibility study would be needed and specific competences would be required (Evangelista et al., 2017). If they are already inside the company, developing the practice is smoother. Conversely, if the management needed to organise employees' training or hire new workforce to supply the needed skills and knowledge, organisational inertia slows down the GLP adoption (Giunipero et al., 2012; Centobelli et al., 2017).

Finally, difficulties can arise when monitoring the developed initiatives (Perotti et al., 2012). It is fundamental to periodically control the GLPs performance, comparing achieved results against the expected ones (Laguier et al., 2021). However, some companies could suffer difficulties in measuring environmental performances. This can be a strong deterrent behind GLPs adoption. If companies cannot measure their improvements, they can barely understand and evaluate the related benefits (Marchet et al., 2014). Owning effective monitoring instruments and processes strongly encourages companies to develop GLPs thanks to increasing awareness and consciousness of the potential gains (Perotti et al., 2022).

### *Aligning green logistics with corporate strategy*

Logistics operations are strategically crucial to achieve environmental sustainability as they influence the entire supply chain, and companies are progressively aligning environmental management practices with their business strategies (Laari et al., 2018). Having green initiatives that are fragmented and disconnected from corporate strategy generates loss of productivity, efficiency and effectiveness and eventually yield poor results in terms of environmental outputs (Carter and Rogers, 2008; Kazancoglu et al., 2021). However, there is uncertainty about how to align green logistics with the overall corporate strategy (Laari et al., 2018; Perotti et al., 2022), as this requires structural changes and time, and we lack a common and homogeneous approach (Evangelista et al., 2017). In this sense, the strategic alignment of corporate strategy, sustainability objectives, and governance mechanisms should be applied at tactical and operational levels, and such an endeavour represents a step change (Formentini and Taticchi, 2016).

Some companies first introduce sustainability goals into their mission, then develop financial reports to include specific sections that demonstrate companies' efforts to improve environmental performances and

share positive results (Carbone et al., 2012; Isaksson et al., 2017). These results might be expected to satisfy customers, to stay ahead of more stringent regulations, or to react to pressures from banks and investors (Cucari et al., 2018). For example, investors are increasingly embracing capital-allocation strategies that take environmental, social, and governance (ESG) issues into account (Garcia and Orsato, 2020; Widyawati, 2020). Sustainability and business success goals can go hand in hand, as a positive link exists between ESG and financial performance (McKinsey, 2021). However, companies and investors often thought of ESG reporting as a form of greenwashing, an issue more relevant for marketing and communications than an actual financial issue (Uyar et al., 2020).

Therefore, companies also need a change in the existing operational practices (Jazairy et al., 2021). Green logistics development is performed gradually from informal actions to formalised plans and approaches (Evangelista et al., 2017); i.e., some companies first develop low-level GLPs that simultaneously improve their green image and spread the green culture needed to foster the definition of a formal sustainability strategy (Carter and Rogers, 2008). This kind of GLPs mainly concern “pollution prevention” and “compliance adherence”, and often receive special funding for their development (Bahr and Sweeney, 2019). The former includes GLPs aimed at reducing CO<sub>2</sub> emissions, while the latter encompasses actions aimed at complying with defined standards. For example, ISO 14001 has become a leading reference within organisations, influencing also top management commitment and leadership (Curkovic and Sroufe, 2011). Nevertheless, green logistics development is threatened by the inadequacy of sustainable performance assessment systems (Oberhofer and Dieplinger, 2014). No shared context-based metrics exist (Ahi and Searcy, 2015) and companies find it rather difficult to develop good measurement systems that can help in assessing and steering the strategic alignment of governance mechanisms, sustainability objectives and corporate strategy (Formentini and Taticchi, 2016; Shaw et al., 2021). Internationalisation is then a further challenge, as individual countries developed their own assessment of GHG emissions (Colicchia et al., 2013). The creation of internationally shared measurements and standards might enable environmental protection by providing clear and transparent information to all the actors involved (Perotti et al., 2022).

In addition, it is important not only to establish formal programs but also appoint specific individuals or groups to lead specific initiatives (Evangelista et al., 2017). They can be accountable for the ownership of the process and for setting objectives, but also for the execution and reporting on environmental initiatives (Rossi et al., 2013; Oberhofer and Dieplinger, 2014). Organisational support, especially from top management, is essential to advance GLPs as it gives employees motivation and resources to successfully implement environmental actions (Evangelista et al., 2017). Whether GLPs are developed with a bottom-up (i.e., promoted by employees) or a top-down (i.e., pushed by management) approach, embracing logistics environmental sustainability requires a shift in the firms' culture towards a more holistic consideration of sustainability within the firm (Perotti et al., 2012). This can contribute to raise awareness within the firm and across the supply chain (Colicchia et al., 2013), and overall success is determined by the importance

attributed to environmental sustainability, the presence of an explicit environmental strategy, its incorporation into the corporate strategy, and clear accountability for environmental issues within companies (Rossi et al., 2013). The role of the organisation's governance, in this sense, is essential for the successful implementation of GLPs (Formentini and Taticchi, 2016).

## Methodology

To address the research question, we conducted qualitative case research, as it improves understanding about how notional arguments are inflected in the empirical world and creates opportunities for pushing forward theory through the collection of rich empirical data (Eisenhardt, 1989; Yin, 2014). Figure 1 illustrates the research framework derived from the extant literature. GLPs adoption rely on a set of key pillars, i.e., workers' awareness and engagement, available skills and knowledge, decision-making processes design, and monitoring and control procedures. Previous contributions (Rossi et al., 2013; Evangelista et al., 2017; Laari et al., 2018) suggested that green logistics (and the related GLPs adoption) could be aligned with corporate strategies by properly formalising environmentally-oriented practices, by defining an opportune governance, and by clearly acknowledging their accountability within the organisation. We aimed at elaborating the extant knowledge on the topic by addressing the RQ *"How do companies align logistics environmental sustainability with corporate strategy to foster the adoption of GLPs?"*.

*Take\_in\_Figure\_1*

### *Research design and sample selection*

The research methodology is presented in Figure 2. We first reviewed academic contributions to gain an initial portrait of the available academic knowledge. Relevant articles were collected after having defined keywords within the scope of the study. "Logistics" and "supply chain" were chosen to identify the context, "green" and "sustainability" to define boundaries, "strategy" and "alignment" to limit the scope. Different keywords combinations were tested, combining them by using different Boolean operators (AND/OR) to explore the potential variety of the results. Moreover, logistics environmental sustainability is far from being a pure academic problem and instead deeply concerns practitioners and policymakers (Abbasi and Nilsson, 2016; Hugel-Brodin et al., 2020). We thus consulted a wide range of grey literature sources including industry and government reports, discussion papers, and other public documents. According to Stentoft and Rajkumar (2018), this was instrumental to analyse properly the available practical knowledge and increase the study's practical relevance.

*Take\_in\_Figure\_2*



We then chose a multiple case approach and designed an embedded study (Yin, 2014), choosing “logistics environmental sustainability strategies and practices” as embedded sub-units of analysis within larger units of analysis represented by broader “corporate strategies”. We focused on the Italian logistics industry, which is one of the largest in Europe with an overall market value higher than €80billion (Prataviera et al., 2021). In recent years, environmental issues have started to be progressively perceived as crucial by logistics and transport companies (Colicchia et al., 2013). Despite the many claims and public announcements, a limited number of companies prioritise sustainability (Evangelista et al., 2017).

The selection of cases and informants aimed at maximising conceptual insights and understanding (Eisenhardt, 1989), choosing companies which considered environmental sustainability as a priority. We only targeted large companies as they are usually more prone to formalise and develop logistics environmental sustainability. This was deemed necessary to contextualize how companies could align green logistics with strategic purposes and to identify potential best practices. As appropriate cases we considered both LSPs and shippers, in line with similar recent contributions (e.g., Jazairy et al., 2021). Organisations were then clustered according to their nature of logistics service providers (LSP.No.) and shippers (SH.No.). In total, 13 firms (six LSPs and seven shippers) took part in the study (Table 1).

### *Take\_in\_Table\_1*

#### *Data collection*

We designed a semi-structured interview questionnaire (provided in Appendix A) to collect data rigorously while allowing interviewees to follow any line of inquiry which they deemed relevant for the study’s purposes (Voss et al., 2002). The widely adopted and accepted format of the funnel model was used, sharing the interview questionnaire in advance to allow interviewees to prepare. This also allowed companies to involve people who were the best possible informants for our study and ensured that interviewees were aware of their companies’ green actions. Two interviews were conducted for each case, and multiple investigators were involved to mitigate observer bias (Yin, 2014). Interviews involved different types of managers, thus providing viewpoints from different functional domains within firms. At least two managers from each of the thirteen companies were interviewed.

In total, 26 interviews were conducted online between February 2021 and July 2021, using Microsoft Teams because of the ongoing pandemic and the related travelling restrictions. Each Interview lasted approximately 120 minutes, and instruments (recorder and written notes) were used to consolidate the collected information and later transcript data. Once the data were collected, the draft of notes and the final documentation of each case were sent back to the interviewees for final approval, to check the level of validity and accuracy between the data collected and their ideas and increase the study’s reliability (Yin, 2014). An integrated case study database was also developed and regularly updated during the research.

Downstream to each interview, data were homogeneously collected in pre-structured case outlines through MS Excel spreadsheets (Voss et al., 2002). The adoption of a standard format made it easier to position data related to a particular subject within cases and simplified the cross-case analyses (Yin, 2014).

### *Data analysis*

The first step in the analysis was coding the collected data. A provisional initial list of coding categories was created leveraging constructs taken from the available literature (e.g., Rossi et al., 2013; Evangelista et al., 2017), such as the degree of formalisation of green targets and their measurement, or the organisational accountability for environmental sustainability. Categories were refined after each interview, iteratively comparing the information collected from the different cases and reformulating it whenever more meaningful insights emerged, as suggested by Yin (2014). Both within-case and cross-case analyses were performed to identify important similarities and differences, as recommended by Eisenhardt (1989). Ellram's (1996) recommendation related to open coding was adopted, and empirical data were first broken down, examined, and compared to strengthen existing constructs and develop new categories. We analysed the targets (if any) for each case, as well as the measurement systems in place. Other important constructs were the centralisation of the environmentally oriented decision-making and the creation of a proper governance system. Open coding paved the way for axial coding, to make connections between categories and look at their interactions (Yin, 2014). Initial codes were refined according to the themes that emerged from the data and grouped into higher-level categories, also suggested by Ellram (1996). Specifically, the answers to the semi-structured interview questionnaire were elaborated and organised around attributes which also linked back to the literature (e.g., targets formalisation and measurement were clearly separated; see Table 2). New categories were also developed, such as the relevance of budgeting and how it is considered across the study's sample. We also explicitly linked governance to the organisational footprint of the interviewed companies. To adopt suggestions from Eisenhardt (1989) and Yin (2014), findings from single cases were then compared in a cross-case analysis for matching patterns, and multiple dimensions that characterise environmental sustainability alignment with corporate strategy were developed. We then analysed differences and common patterns to identify different stages of alignment (early, medium, and advanced) which were detailed for each of the identified dimensions (Table 3).

### **Findings**

Findings and insights from the examined cases are hereinafter described, offering first a within-case perspective for LSPs and shippers and then the related cross-case analysis.

#### *LSPs*

LSP.1 offers integrated transport and storage solutions, with strong expertise in the FMCG industry and specific assets to satisfy customers' temperature requirements. LSP.1 exemplifies how green logistics is not

yet a concept which is completely permeated within companies' strategy, even for LSPs. Its logistics manager observed that "even if there is a growing interest for sustainability as a topic, which is increasingly more discussed when planning the long-term future of operations, it still does not represent a priority when tendering and contracting with business partners". Pressures from customers (i.e., shippers) made LSP.1 increase its GLPs including the release in 2020 of its first sustainability report. Because of the insufficient adequate internal knowledge on sustainable performance measurement, the report was developed by an external consultancy company. Nevertheless, there is no specific measurement in place and the report mainly concerns general guidelines and communications. As a general approach, any GLP is first discussed by the board of directors and, if approved, budget is allocated. However, LSP.1 does not have any specific budget for environmental sustainability, nor it created any department accountable for environmental sustainability practices.

LSP.2 is an express courier multinational company, operating in Europe, US, and Canada. The Italian branch counts 147 facilities and 13 distribution centres. Its mission includes operational excellence, without mentioning sustainability. However, sustainability targets are defined centrally at a corporate level (beyond the Italian branch) and spread downstream. This led to obtaining several certifications and the company recently achieved the Silver Ecovadis certification. The company aims at becoming carbon neutral upmost 2022 through compensation initiatives, and carbon free by 2045. Measurement takes place in an aggregated way, including both operational business units (e.g., last-mile delivery, line-haul transport) and staff functions (e.g., marketing and sales). The company has been publishing an annual sustainability report at corporate level since 2018. The company created a corporate unit accountable for environmental sustainability and appointed an environmental manager for each national branch in 2016 to develop initiatives oriented at achieving the expected targets.

LSP.3 is a leading provider with 54 sites in Italy (including 9 distribution centres) and 120 thousand delivery points. Their approach towards sustainability is defined at corporate level and then shared across business units through three pillars, namely "community", "planet", and "ecosystem". The company drafts a consolidated sustainability report which includes corporate-level targets, progress, aligning plans and expected outcomes with the United Nations Sustainability Development Goals (SDGs). Their sustainability report includes a Benefit Impact Assessment (BIA), needed to become a certified B-Corp organisation. From an organisational viewpoint, communication, divulgation, and training activities take place to increase people's awareness and commitment. Each business unit has a sustainability manager, and the company created an impact team to monitor environmental performance. It is a cross-functional team, with managers from different business units. However, no fixed budget is allocated to sustainability actions.

LSP.4 is a multinational company mainly offering B2B integrated logistics solutions. It directly manages more than 3,000 trucks, and indirectly approximately 2,000 vehicles, which connect with more than 30 distribution

centres in Italy and Europe. In terms of certifications, it achieved ISO 9001 for quality management and ISO 14001 for sustainability management. Sustainability initiatives are formalised into a corporate plan which defines objectives to be achieved between 2020 and 2025 (mainly concerning GHG emissions reduction). In terms of measurement, the company relies on an external consultancy firm that also drafts the company's sustainability report. A cross-functional team was created, leveraging heterogeneous skills and knowledge, to centrally manage sustainability actions. There is not a budget assigned to sustainability, but after the release of the corporate plan, there is higher flexibility towards funding projects accepted by the top management. However, investment and operational costs are accounted on the business unit which is mainly responsible for each project.

LSP.5 is also a multinational corporation, with 37 sites distributed across Europe and offering air, sea, and road freight logistics services. Their approach towards sustainability has been progressively formalised since 2018. Specific targets were defined for each business unit and in 2020 a sustainability function working laterally to the other business units was created to promoting a huge cultural transformation. The company also appointed sustainability managers for each business unit and released in 2021 its first sustainability report. It included precise and quantitative assessment of the expected targets, collecting, and analysing historical data for the past three years. Such data "serves to guide the short and long terms objectives of the business" (as highlighted by the LSP.5 sustainability manager). The aim is to identify the necessary competences and the impact of each GLP, including the portion of the fleet that the company do not directly manage. Until 2021, green initiatives were unstructured with a budget directly allocated to fleet management and business development department. From 2021, a specific budget is allocated to each business unit and to the specific sustainability function.

LSP.6 is a multinational corporation which manages 29 sites across Europe but mainly operates in Italy with approximately 1,500 trucks. The sustainability initiatives are aligned with the corporate strategy via the explicit consideration of the environmental sustainability urgency in the company's mission and explicitly referring to United Nations SDGs. The company achieved the ISO 14001 certification but is still evaluating several tools to measure the environmental footprint. No specific organisational unit is dedicated to sustainability, and each business unit is individually accountable to develop environmental sustainability but without a specific budget. GLPs are mainly introduced via sharing the investment costs with the company's customers. LSP.6 innovation and sustainability manager reported that "not all the customers agree, but the pressure from the final customers and governments is rising. Therefore, they are increasingly prone to share investments for sustainability".

### *Shippers*

SH.1 is an Italian multinational company active in the coffee industry, with 13 facilities in Europe and more than 90 worldwide. The company is strongly engaged in sustainable practices concerning the manufacturing

processes, aiming at carbon neutrality by 2030. It is a high-level objective with still needs to be operationalised properly; to speed the formalisation of its sustainability programme, the company started publishing a sustainability report to show their commitment publicly. As distribution is increasingly becoming a concern for consumers, the company is now interested into developing GLPs. Despite efforts to improve their measurement systems, the company still struggles with understanding the required data accuracy level to assess their GLPs. Moreover, their sustainability report is limited to distribution centres and other logistics hubs because they outsource transport operations to an LSP and do not have visibility to the fuel consumed and emissions generated by their LSP. The company does neither have any budget nor specific function for green logistics.

SH.2 is an Italian clothing manufacturer specialised in women's underwear. It owns 13 plants, of which 7 are in Italy, 2 in Serbia, and 4 in the USA. The company is characterised by a strong vertical integration in manufacturing operations across their supply chain, from the yarns production to the clothes' packaging processes. SH.2 defined green targets but did not align them with their corporate strategy. Top management's commitment to sustainability is low, and managers don't guide sustainable evolution. Green practices (rarely concerning logistics) usually emerge from employees suggesting improvements in a bottom-up approach. Sustainability projects have ad-hoc indicators to monitor their status, without a uniform and shared measurement system. The company did not set up any organisational unit accountable for sustainability, nor any budget is assigned to foster sustainability initiatives.

SH.3 is an Italian luxury fashion company with a wide product range including leather goods, shoes, accessories, apparel, jewellery, watches, make-up, perfumes, and a collection of home furnishings and decorative accessories. The company is increasingly committed to environmental sustainability actions; as acknowledged by SH.3 supply chain manager, "we have to follow and chase the concerns from our customers, to keep the trendiness and innovativeness of our brand". From an organisational viewpoint, the company formalised a sustainability strategy which however relies only on qualitative claims. It releases a sustainability report, but no quantitative targets have been defined yet nor any punctual measurement system is used to assess the carbon footprint and environmental impact of their logistics operations. The company recently put in place corporate social responsibility (CSR) and sustainability team and appointed a CSR manager, but they have not yet allocated a budget for environmental sustainability initiatives. Any time an initiative is proposed, top management approval must be obtained for budget allocation.

SH.4 is the Italian branch of a multinational company operating within the soft-drink industry. They acknowledge the importance and impact of logistics operations, to serve the myriad of customers spread across the country. They increasingly align sustainability with the corporate strategy, having formalised and quantified targets (aligned with United Nations Sustainability Development Goals) at a multinational and national level to be reached by 2025 and 2050 respectively. SH.4 has been releasing a sustainability report

for a decade, which include success stories, future goals, and granular progress on KPIs. It also created several functions who are accountable to foster sustainability, although most are coordinated by a higher-level CSR department which collects transversal and heterogeneous skills and knowledge. There is a budget for sustainability at corporate level that however is not managed by the CSR department but by top management at country level.

SH.5 is an Italian multinational company operating in the dairy industry, specialised in milk-derivative products. It operates 19 production facilities world-wide, 11 of which are in Italy and only 4 outside Europe. They consider their logistics operations as highly critical because of the products temperature and shelf-life requirements. Therefore, the company took a strategic orientation towards logistics environmental sustainability following the United Nations SDGs. The objectives within their environmental sustainability strategy are quantitatively defined for different business units, with measurement systems in place underpinned by access to real-time data. The company drafts an annual sustainability report to monitor performance, assess targets' achievement, and discuss targets' update. Each business unit have sustainability team leaders, who are also members of a sustainability function aimed at project management and coordination. Each business unit also has a specific budget committed to environmental sustainability initiatives, including logistics.

SH.6 is one of the leading retailers in the Italian grocery industry, owning 52 logistics facilities in Italy and directly managing (i.e., not outsourcing to LSPs) its warehousing and handling operations. Improving the environmental footprint of logistics operations is acknowledged as a strategic objective, and the company releases an annual sustainability report. However, as admitted by the SH.6 supply chain director, "the assessment of the performance only started in 2017 and mainly remains at a qualitative level". Therefore, the company is introducing a measurement system to assess logistics emissions generated from suppliers and industrial distribution centres to retailers. In 2020, the company created a business department to foster sustainability projects and created a sustainability budget for each business unit. However, "currently there are rumours that the sustainability budget will be centralised into the sustainability and CSR department" (SH.6 regional manager).

SH.7 is a UK multinational company active in the spirits industry, operating across Europe with several national branches (including Italy). It set its environmental strategy at a corporate level, and then extended it to all its business units. Concerning logistics, it mainly aims at optimizing shipments' utilisation rate to minimise costs (and consequently GHG emissions). The goal is to reduce logistics GHG emissions by 50% and achieve corporate carbon neutrality by 2030. They do not currently have an organisational unit accountable for environmental sustainability, and initiatives are left to individual business units. Whenever necessary, those business units can ask for money to develop environmentally oriented investments. There is no specific budget for sustainability, but the company's approach is to give high priority to any environmentally

sustainable initiative. However, as reported by SH.7 Europe Head of Logistics, “We started to introduce a budget for sustainability, but is centralised and does not pertain specifically to logistics”.

Table 2 summarises the findings obtained from the cases, linking the attributes on the columns to the questions used during the semi-structured interviews.

### *Take\_in\_Table\_2*

#### *Cross-case analysis*

Elaborating within-case insights into a cross-case analysis led us to identify five main dimensions which describe and characterise the alignment of logistics environmental sustainability with corporate strategy: i) degree of awareness; ii) degree of formalisation; iii) measurements systems; iv) governance and accountability; v) budget allocation.

The awareness about the ongoing climate crisis makes environmental sustainability a strategic priority for many LSPs (LSP.3, LSP.4, LSP.5, LSP.6) that arrange regular meetings to plan, discuss, and review future actions. Conversely, LSP.1 and LSP.2 considered becoming environmentally sustainable as an important target but less so than being cost-efficient or having high service levels. On the other hand, some shippers (SH.1, SH.3 and SH.4) highlighted how final customers usually perceive them as responsible for the environmental sustainability of the overall supply chain, and thus developing a green image is important to create and maintain competitive advantage. Nevertheless, logistics is often considered as a support activity outsourced to third parties, and its alignment with corporate strategies is limited. As stated by SH.4 logistics manager, “logistics is often considered as an ancillary activity, and green marketing still plays a fundamental role”, confirmed also by SH.5 sustainability manager who admitted that “shippers mostly focus on packaging, as this directly affect consumers’ perceptions”.

With regards to the degree of formalisation, both LSPs and shippers introduced targets related to reducing plastic usage and transport GHG emissions. However, shippers often develop corporate targets that aggregate manufacturing and logistics processes. Some firms (LSP.3, LSP.6, SH.4, SH.5) formalised “pillars for sustainability” following the 17 Sustainable Development Goals (SDGs) developed by the United Nations. SH.4 further developed them by designing for each SDG specific objectives and KPIs for each business unit. On the other hand, SH.2 and SH.3 have qualitatively set the direction toward sustainability, without setting quantitative targets. Objectives are set at a corporate level and then shared across the different departments in a top-down approach. LSP.2, LSP.3, LSP.5, and LSP.6 introduced precise quantitative objectives to be achieved within a defined deadline. SH.1 and SH.7 formalised carbon targets to be achieved upon 2030, but also highlighted the need to find more reliable way to measure and monitor progress. Many companies start

from introducing sustainability reports that help reflect upon the problem and set future directions. However, adopting appropriate measurement systems is acknowledged as a fundamental element to enhance environmental sustainability. Quantitative data can feed analyses aimed at evaluating the achievement of the goals included in corporate strategies (LSP.4, LSP.5). As reported by LSP.4 sustainability manager, “objectives are set at a corporate level and then shared across the different departments in a top-down approach”. Nevertheless, targets for sustainable improvements are heterogeneous within the industry and may be inconsistent, thus recommending the involvement of external qualified partners. LSP.1 and LSP.4 collaborated with third parties to develop measurement systems increasingly precise and customised, but collecting the right data is deemed as highly critical (LSP.5, LSP.6).

From an organisational perspective, companies introduced different roles or functions that could be accountable for sustainability. LSPs have usually appointed environmental sustainability managers, who are responsible for short-term actions and other local initiatives. LSP.3, LSP.4, and LSP.5 built a team of people with cross-functional competences who allocate part of their time to improving company’s environmental performance, while LSP.2 also created a centralised sustainability department at a corporate level and LSP.3 established an “impact team” to monitor performance and manage sustainability-oriented initiatives. Shippers also appointed managers to coordinate sustainability actions across the different functions (SH.5) or established cross-functional teams (SH.6). As reported by SH.5 supply chain manager, “we built a team of people with cross-functional competences but also a centralised sustainability department at corporate level. This increased the alignment of logistics with the rest of the company’s operations”. However, shippers do not usually have specific figures assigned to managing green logistics, which is mostly embedded into corporate teams which considers logistics along the other business functions (SH.3, SH.4, SH.6).

Lastly, the acknowledgement of the importance of logistics environmental sustainability is not reflected by the allocation of appropriate budgets. The interviewed case companies allocate resources to individual initiatives whenever the top management deemed it opportune. However, LSP.5, SH.5, and SH.6 highlighted the recent introduction of a specific budget for sustainability, which can be centrally managed (SH.4) but in a few cases could be soon spread across different business units to bolster new initiatives (SH.3).

## Discussion

Environmental sustainability can create a strategic opportunity for differentiation in logistics, but significant challenges can emerge (Kazancoglu et al., 2021). Heretofore, LSPs and shippers have limitedly introduced environmental concerns into corporate strategies to develop robust environmental strategies (Giuffrida and Mangiaracina, 2020). Our findings (summarised in Table 2) led to develop Table 3, which offers a framework that details different stages of alignment concerning the relevant dimensions identified.



### *Take\_in\_Table\_3*

First, the overall degree of awareness about the urgency and the importance of the problem seems rising. Efforts towards the alignment of logistics environmental sustainability with corporate strategies are increasing, especially for LSPs and this is in line with Isaksson et al. (2017). On the other hand, few shippers included green logistics among strategic priorities, and this is in contrast with what stated by Bahr and Sweeney (2019) who pointed out a higher interest of shippers for environmental sustainability. LSPs increasingly consider environmental sustainability in logistics a strategic priority directly related to their core business, while shippers' awareness still seems generally driven by pressures from their customers and particularly final consumers.

LSPs and shippers are also characterised by different degrees of formalisation, and this also links back to their core business and how they deliver their value propositions to customers. Both LSPs and shippers formalise initiatives and targets for green logistics, but shippers often develop approaches which are not focused on logistics and aggregate logistics with manufacturing operations. Most of the participating LSPs introduced objectives to define a pathway for the future and leveraged United Nations SDGs to contextualise and design their actions. Following this attitude, some LSPs defined quantitative objectives to be achieved within a specific time horizon. In the case of shippers, they sometimes define only qualitative targets, which are nonetheless included within sustainability reports. Overall, most of the companies highlighted the importance of drafting sustainability reports to legitimise themselves before society by raising awareness of their environmental performance, as acknowledged also by Kazancoglu et al. (2021). Evidence gathered from the case companies show that releasing such instruments is often a first step which help define targets and identify appropriate measurement systems. Both LSPs and shippers can start from introducing CSR principles and using them to shape qualitative directions for the future. However, this study elaborates previous theory by highlighting how companies eagerly need to develop a precise measurement of corporate performance, to transform qualitative aspirations into quantitative statements (Oberhofer and Dieplinger, 2014; Centobelli et al., 2020). Developing specific KPIs to measure and monitor progress made on well-defined objectives is widely considered a powerful leverage to consider (Evangelista et al., 2017), but collecting the accurate data can be critical. In this context, innovative technologies can represent an unprecedented opportunity to support companies to adopt measures able to reduce emissions and achieve their logistics environmental sustainability goals (Centobelli et al., 2020).

Furthermore, Isaksson et al. (2017) stated that Italian companies (and particularly LSPs) usually lack specialised sustainability departments. However, our findings show that Italy-based companies improved significantly in recent years in terms of governance and accountability. They have been appointing managers to deal with environmental issues and creating cross-functional teams with increasing commitment (Rossi et al., 2013). LSPs increasingly appoint logistics environmental sustainability managers, but shippers consider

having high degree of alignment between environmentally conscious logistics and corporate strategy fundamental for ensure progress on environmental sustainability. In this way, they can take advantage of corporate cross-functional teams who collect skills and knowledge from heterogeneous backgrounds (Laari et al., 2018). Unfortunately, even though the case companies have an increasing commitment on environmental sustainability, this is not reflected by the allocation of specific budgets to sustainability initiatives, which limits progress the logistics operations can be made. Companies seem often motivated more by the need of aligning with regulations or by the willingness to keena a “green image”, than by a sincere understanding of the problem, and this seem to confirm previous studies (Colicchia et al., 2013; Jazairi et al., 2021). However, this reactive and myopic approach prevents supply chains from adequately facing the upcoming environmental crisis (Huge-Brodin et al., 2020).

Expanding the view from the individual dimensions, i.e., the rows in Table 3, it is possible to identify, define and describe early, medium, or advanced stages of alignment of green logistics with their corporate strategy - thus looking at the columns of Table 3. By embracing the different dimensions altogether in such a “column-view” it is possible to isolate broader profiles of companies in relation to their stage of alignment of green logistics with corporate strategy. These broad profiles could be linked to the literature discussing the strategic alignment of sustainability with corporate strategies, and in particular adopting the viewpoint supporting that better alignment can lead to better effectiveness of sustainability actions (Le, 2022; Cavaleri and Shabana, 2018). In an early stage of alignment, companies do not include green logistics in their corporate strategy and limit their efforts to defining qualitative targets that are not precisely measured. They also could appoint an employee as responsible for green initiatives, but the potential actions are quite limited as there is no budget for environmental sustainability. When companies progress to a medium stage of alignment, logistics environmental sustainability is explicitly acknowledged as supportive to the corporate strategy. This means that targets are quantitatively defined, with some kind of high-level measurement systems in place. With respect to the early stage, multiple employees become accountable for green actions as part of a dedicated cross-functional team. There is also a budget to develop initiatives, which is however shared across different business units thus limiting the logistics firepower. Finally, when logistics environmental sustainability is core to the corporate strategy companies are characterised by an advanced stage of alignment. Targets are granularly defined in quantitative and qualitative way, and specific KPIs are adopted to precisely evaluate targets’ achievement. Companies create cross-functional teams with people fully committed to developing environmental sustainability, and every business unit (including the logistics function) can manage a budget for environmental initiatives. This, according to the mentioned literature (e.g., Le, 2022; Cavaleri and Shabana, 2018), is deemed to be the stage of alignment leading to better effectiveness of sustainability actions and potentially to improved firm performance (Schrettle et al., 2014; Golicic and Smith, 2013), which could deserve to be further investigated in future research endeavours on green logistics.

## Conclusions

Logistics activities generate negative impacts on the environment, and companies are increasingly required to work actively to minimise such effects (Sweeney et al., 2018; Hugel-Brodin et al., 2020). Given the rising awareness about the problem, environmental sustainability is transforming into a competitive advantage, until even turning into a prerequisite for companies' survival (Singh and Trivedi, 2016). Therefore, in the logistics industry, an environmental sustainability culture should be spread within the entire organisation, and it should be reflected in the overall corporate strategy (Rossi et al., 2013). Companies need to develop approaches that innovate organisational cultures to align green logistics with corporate strategies and then turn sustainability into practice (Evangelista et al., 2017; Etzion, 2007; Del Baldo, 2010).

This research explored the alignment of logistics environmental sustainability with corporate strategy, based on multiple embedded case research that includes expert views from 13 Italian LSPs and shippers. Literature-based insights were combined with empirical data to develop a framework that includes five main dimensions to describe alignment: degree of awareness, degree of formalisation, measurement systems, governance and accountability, and budget allocation. The framework different stages of alignment (early, medium, and advanced) detailed for each of the identified dimensions.

From an academic perspective, this study is one of the first studies to provide an overview about how to align environmental sustainability with corporate strategies when green logistics is concerned, suggesting potential avenues for leveraging the concept strategic alignment to improve the effectiveness of sustainability actions and firm performance. It highlights the importance to introduce precise targets and appropriate measurement systems to ensure sustainability programmes set by shippers and LSPs go from targets to actions. Also, it shows that clear accountability is crucial, along with the allocation of specific resources to sustainability projects. However, the paper also acknowledges that some companies seem motivated more by expected reputation benefits than by a sincere understanding of the problem, and this prevents them from adequately facing the upcoming environmental crisis. Therefore, the study intends to provide practitioners with insights that could support green logistics operationalisation, fostering the alignment between corporate targets and pragmatic actions.

Both perspectives of LSPs and shippers are illustrated and discussed, and it offers a framework that details different stages of alignment with respect to the identified relevant dimensions. Findings could help companies in shaping logistics environmental strategies, offering a way ahead to managers willing to mitigate the negative environmental effects of logistics activities.

Lastly, the limitations that characterise this paper could pave the way for promising research avenues in the future. First, the empirical investigation was limited to the Italian context, and investigating other countries could enhance findings' generalizability and strengthen the emerging managerial implications. As we considered large companies, elaborating on the company size could offer further insights into this phenomenon. Moreover, a deeper investigation focused on specific industry sectors might be beneficial to

highlight possible further interesting considerations. Lastly, we adopted a qualitative approach, while quantitative survey could be conducted leveraging the available literature to test specific hypotheses concerning green logistics' operationalisation. This could also regard the study of the relationships between the strategic alignment of sustainability strategies and firm performance – something that has been explored in the literature in more general terms and not with specific reference to green logistics.

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Case	Revenues (2020)	Interviewee 1 Role	Interviewee 2 Role	Interviewee 3 Role
LSP.1	€ 200-300 M	Logistics Manager	Warehouse Manager	
LSP.2	€ 500-600 M	Marketing Manager	Quality Manager	Environmental Manager
LSP.3	€ 200-300 M	Marketing Manager	External Relations Manager	Sustainability Manager
LSP.4	€ 800-900 M	Logistics Manager	Sustainability Manager	Marketing Director
LSP.5	€ 600-700 M	Sustainability Manager	Brand Manager	Operations Manager
LSP.6	€ 300-400 M	Innovation Manager	Supply Chain Manager	
SH.1	€ 1.4-1.5 B	Supply chain Manager	Transportation Manager	
SH.2	€ 100-200 M	Plant Director	Supply Chain Manager	
SH.3	€ 5.5-5.6 B	Leather Logistics Director	Supply Chain Manager	
SH.4	€ 800-900 M	Logistics Manager	Logistics Specialist	Sustainability Manager
SH.5	€ 800-900 M	Supply Chain Manager	Sustainability Manager	Plant Director
SH.6	€ 15.5-15.6 B	Supply Chain Director	Regional Manager	Customer Service Manager
SH.7	€ 300-400 M	Europe Head of Logistics	Supply Chain Manager	

**Table 1** – Cases overview

<b>Case</b>	<b>Defining logistics environmental sustainability</b>	<b>Targets to measure logistics environmental sustainability</b>	<b>Organisational footprint to pursue logistics environmental sustainability</b>	<b>Individuals/groups accountable for logistics environmental sustainability</b>	<b>Budget for logistics environmental sustainability initiatives</b>
<b>LSP.1</b>	No formal sustainable strategy defined, but a "growing interest on the subject" due to the pressure of the shippers.	No measurement is performed, only generic communication	No	No	No
<b>LSP.2</b>	Environmental strategy is defined at a corporate (multinational) level in a quantitative way, spreading over national branches	Measurement of environmental performance at corporate level	A centralised unit at corporate level	Environmental managers appointed for each branch	No
<b>LSP.3</b>	Strategy defined through strategic pillars for logistics at corporate level	Benefit Impact Assessment yearly measured	Creation of a cross-functional team along with an impact team	Sustainability manager for each business unit plus the cross-functional team	No
<b>LSP.4</b>	Strategy defined via a strict corporate plan for logistics	Specific targets to be achieved between 2020 and 2025	Creation of a cross-functional team	Cross-functional team	No, but there is increasing interest
<b>LSP.5</b>	Strategy defined at corporate level for logistics operations	Targets defined at corporate and business unit level	Creation of a cross-functional sustainability function	Sustainability managers for each business unit plus the sustainability function	There is a budget for each business unit from 2021
<b>LSP.6</b>	Strategy is formalised at corporate level for logistics	Targets are defined but their measurement is critical and not in place yet	No	A sustainability responsible for each business unit	No
<b>SH.1</b>	Strategy defined at corporate level, limitedly considering logistics	Targets about carbon neutrality by 2030	No	No	No
<b>SH.2</b>	Sustainability is not a strategic priority, and does not include logistics	Development of ad-hoc targets for individual initiatives	No	No	No
<b>SH.3</b>	Strategy defined at corporate level; sustainability is meant to be supportive for the overall strategy but logistics is	Qualitative targets, but no measurement system	Creation of a CSR department	CSR manager	No

	limitedly considered				
<b>SH.4</b>	Strategy defined at corporate level, detailed at national level, including logistics operations	Targets are defined coherently with United Nations SDGs to be reached by 2025 and 2050. KPIs are introduced for each target.	Creation of a CSR department	CSR manager	Yes, controlled by the top management
<b>SH.5</b>	Strategy defined at corporate level, detailed at business unit level, including logistics operations	Targets are defined quantitatively and measured in real-time	Appointment of a sustainability manager for each business unit, and a cross-functional sustainability department	Sustainability department	Budget is allocated to each business unit
<b>SH.6</b>	Strategy defined at corporate level, including logistics	Targets are mostly qualitative; new measurement systems to be introduced	Creation of a sustainability and CSR department	Sustainability and CSR department	Yes, with budget assigned to each business unit
<b>SH.7</b>	Strategy defined at corporate level, limitedly considering logistics	Targets mostly qualitative but with quantitative aspirations (i.e., carbon neutrality by 2030)	No	No	No

**Table 2** – Summary of cases’ findings. Columns are directly linked to the questions presented in the semi-structured interview questionnaire (Appendix A).

Dimension	Stage of alignment		
	Early stage of alignment	Medium stage of alignment	Advanced stage of alignment
<b>Degree of awareness</b>	Logistics environmental sustainability is not included in the corporate strategy	Logistics environmental sustainability is deemed as supportive to the corporate strategy	Logistics environmental sustainability is core to the corporate strategy
<b>Degree of formalisation</b>	Targets are defined in a qualitative way	Targets are defined in a quantitative way	Targets are granularly defined in quantitative and qualitative way for each business unit.
<b>Measurements systems</b>	There are no measurement systems adopted	Measurement occurs at a high-level	Specific KPIs are developed to evaluate the targets achievement
<b>Governance and accountability</b>	There is an individual adding to normal work responsibilities the accountability for environmental sustainability	There is a cross-functional team that adds to normal work collective accountability for environmental sustainability	There is a cross-functional team that is fully committed to developing environmental sustainability
<b>Budget allocation</b>	There is no defined budget dedicated to environmental sustainability	There is a specific budget dedicated to environmental sustainability, which is shared across business units	Every business unit has its budget dedicated to environmental sustainability

**Table 3** – Proposed framework to describe the alignment of logistics environmental sustainability with corporate strategy

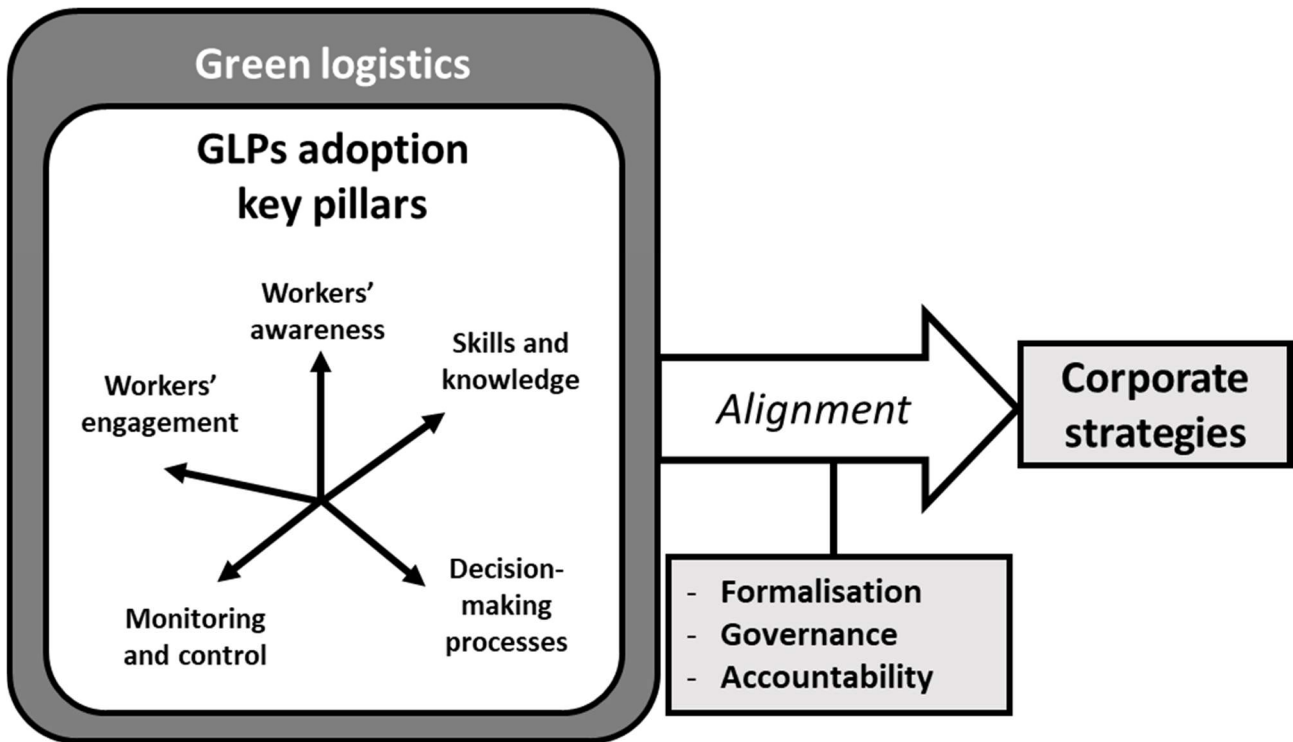
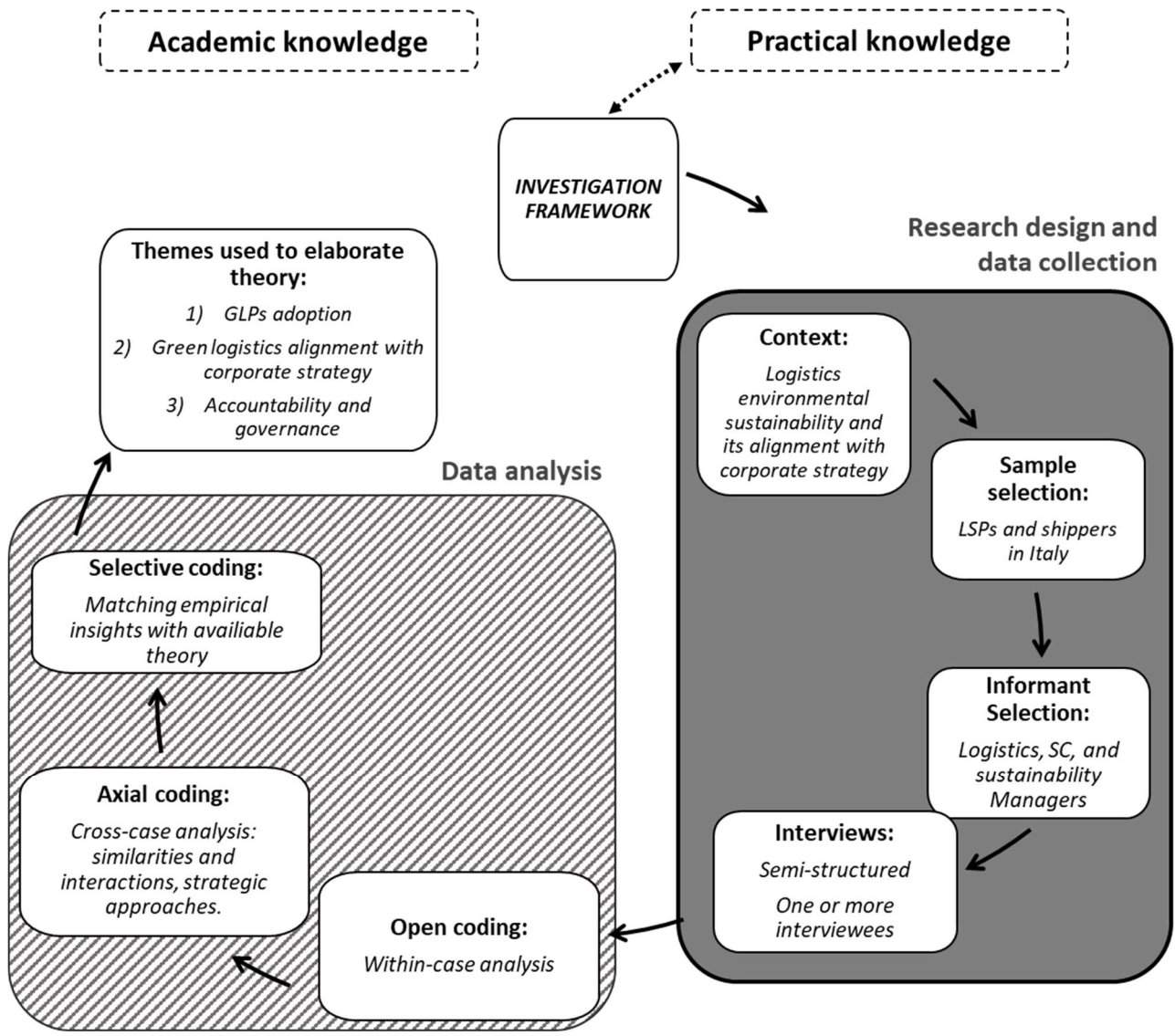


Figure 1 – Research framework



**Figure 2** – Research methodology and data analysis procedures

## Appendix A - Semi-structured interview questionnaire

1. Do you have any strategy concerning the development of logistics environmental sustainability in your organisation? If so, how granular is this strategy (at corporate level, at business unit level, at department level)?
2. Have you defined any specific target to measure your logistics environmental sustainability? If so, how do you measure these targets?
3. What is your organisational footprint to pursue logistics environmental sustainability? What organisational unit is responsible for making decisions about logistics environmental sustainability?
4. Is any individual/group accountable for promoting actions and achieving logistics environmental sustainability targets?
5. Do you allocate any specific budget to logistics environmental sustainability initiatives and approaches when defining the yearly budget? If so, how?