A call to action: a stakeholder analysis of green logistics practices

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Abstract

Purpose – There is a growing body of literature discussing the green logistics practices (GLPs) that companies could introduce to reduce the logistics environmental impact. Current approaches also identify several influencing factors within firms that could serve as barriers to, or enablers of, GLPs. However, less is known about the role of extra-firm stakeholders, even though these are crucial to operationalizing green logistics effectively. This study merges current theoretical understanding with empirical evidence to provide a detailed stakeholder analysis of GLPs.

Design/methodology/approach – Using stakeholder theory as a theoretical lens, the authors aimed at offering a mid-range contribution by conducting multiple embedded case studies examining Italian logistics service providers and shippers. GLPs and the related influencing factors were examined as sub-units of analysis within broader companies' environmental sustainability strategies.

Findings – The authors identified cascading effects among factors influencing the adoption of GLPs (e.g. key economic factors are affected by external factors which also influence organizational and collaboration factors). These effects are moderated by interdependencies between primary and secondary stakeholders, and the study highlights the prominent involvement of secondary stakeholders, such as final consumers.

Originality/value – This paper contributes to better understanding how and why companies adopt GLPs, emphasizing the wide set of stakeholders involved and illustrating how different stakeholders impact on GLPs adoption by affecting a set of influencing factors. By combining insights from the available literature with contemporary empirical data, the authors emphasize how Logistics Service Providers (LSPs) and shippers can no longer address the adoption of GLPs as "focal companies", but only as part of a "focal network of interconnected stakeholders", all of them influencing GLPs adoption.

Keywords Logistics, Green practices, Environmental sustainability, Stakeholder theory, Case research

Paper type Research paper

Introduction

Logistics contributes considerably to greenhouse gas (GHG) emissions (McKinnon *et al.*, 2015; Huge-Brodin *et al.*, 2020), with some scholars suggesting it is responsible for 13% of all such emissions (Perotti *et al.*, 2022). As logistics environmental impacts are expected to increase in step with rising levels of pollution (McKinsey, 2021), addressing logistics environmental sustainability is a big concern for practitioners and policymakers (IPCC, 2021; Klymenko and Lillebrygfjeld Halse, 2022). Principles of sustainable logistics and related actions that companies can undertake have been formalized (Carter and Rogers, 2008; Seuring and Müller, 2008), and the term "Green Logistics Practices" (GLPs) indicates many logistics-related initiatives to reduce the impact on the natural environment (Evangelista *et al.*, 2017).

Reflecting the importance and the urgency of the problem for practitioners, the academic literature relating to green logistics has also grown rapidly (Singh and Trivedi, 2016; Martins

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et al., 2022; Meyer, 2020). Previous scholars formalized influencing factors for GLPs adoption (e.g. Perotti *et al.*, 2012; Marchet *et al.*, 2014), and the importance of such practices is widely acknowledged (Colicchia *et al.*, 2013; Abbasi and Nilsson, 2016; Centobelli *et al.*, 2017). However, we experience a limited understanding and insufficient adoption of GLPs and what companies are doing in practice to tackle the urgency of the climate crisis in logistics is still insufficient (Centobelli *et al.*, 2020b; Sharma *et al.*, 2023). Companies are often overwhelmed by the complexity of the problem, and many of the drivers that are proposed as influencing factors could either be barriers or enablers, depending on different scenarios (Evangelista *et al.*, 2017). Therefore, we are experiencing an "understanding into action conundrum" (Sweeney *et al.*, 2018, p. 867) because "there is a clear understanding of what should be done, and why, but less clarity in terms of how to go about it" (Huge-Brodin *et al.*, 2020, p. 599).

As there is a need to transform current understanding into actionable and context-sensitive knowledge for companies by delving deeper into how such influencing factors could affect GLPs adoption (Centobelli *et al.*, 2020a; Shaw *et al.*, 2021), we formulated the following research question (RQ):

RQ1. How do influencing factors affect the adoption of GLPs?

It is acknowledged, though, that the adoption of GLPs and the related influencing factors depend on a plurality of stakeholders (Huge-Brodin *et al.*, 2020). Given the complexity of contemporary supply chains, it is important to consider the fuller configuration of stakeholders beyond companies themselves (Sarkis *et al.*, 2011; Ahmad and Xu, 2021; Ardakani *et al.*, 2022). To investigate the roles and interactions of multiple, interconnected actors, the stakeholder theory has been suggested as a suitable theoretical lens (Freeman, 1984; Kirchoff *et al.*, 2011). In this context, we argue that the stakeholder theory could help improve understanding the dynamics underlying environmental sustainability operationalization, illuminating the role of individual companies and the actions of other stakeholders (Meixell and Luoma, 2015; Huge-Brodin *et al.*, 2020; Laguir *et al.*, 2021). We thus introduced a second research question:

RQ2. How do different stakeholders affect the factors influencing the adoption of GLPs?

To address these RQs, we conducted multiple embedded case studies. Previous studies have focused predominantly on Logistics Service Providers (LSPs) (Evangelista *et al.*, 2017; Laguir *et al.*, 2021), but GLPs can also be developed by other stakeholders – such as shippers (Jazairy *et al.*, 2021). We thus considered both LSPs and shippers and adopted a mid-range approach (Stank *et al.*, 2017) choosing Italy as our empirical context. Among European countries, Italy has massive traffic volumes for many goods, with a further increase in logistics activities expected in the next few years (Prataviera *et al.*, 2021). It also represents an interesting site for stakeholder analysis because the Italian market is highly fragmented with numerous levels of sub-contracting carried out by both primary shippers and LSPs (Perotti *et al.*, 2012). Finally, recent work suggests that only 20% of Italian companies acknowledge sustainability as a strategic priority (Evangelista *et al.*, 2017), and this highlights the fact that important actions are not only possible but also highly needed.

To foreshadow our findings somewhat, our research elaborates previous understanding by offering a stakeholder analysis of GLPs. We explore GLPs adoption against the related influencing factors and investigate the effect of stakeholders' pressures on those influencing factors. While most of the existing studies inform the academic and industrial communities about what practices are adopted by organizations and what influencing factors they perceive or have experience of, this study examines which stakeholders exert an effect on the influencing factors and thus influence the various GLPs adopted by organizations. By providing this original view and merging theoretical with empirical insights, we extend the current knowledge about how firms adopt GLPs and how they are driven in this adoption by stakeholders and influencing factors. We can thus propose actionable knowledge for

practitioners, as these contributions improve the prospects for companies wanting to embed environmental sustainability across their supply chains.

The paper is structured as follows. First, we review and synthesize relevant literature, then we outline our methodology and detail findings. In our discussion and conclusion, we identify implications for theory and practice and make suggestions for future research.

Related literature

Green logistics practices (GLPs)

Green supply chain management consists of integrating environmental concerns within supply chain management (Carter and Rogers, 2008; Seuring and Mü ller, 2008). It aims not only to reduce or compensate for the negative impact of supply chain activities, but also to develop new solutions that replace the ones that pollute (Abbasi and Nilsson, 2016). Thanks to the increasing importance acknowledged to logistics when pursuing environmental sustainability, many GLPs have been developed in recent years to reduce the carbon footprint left by companies and supply chains (Huge-Brodin *et al.*, 2020). Previous studies have broadly considered GLPs related to transportation, warehousing, and inventory management, conceptualizing them as either intra-organizational (or internal) practices or inter-organizational (or external) practices involving multiple supply chain partners (Centobelli *et al.*, 2020b).

To provide an organic overview of GLPs and consolidate the existing practices, some scholars have categorized them into taxonomies (e.g. Ciliberti *et al.*, 2008; Lieb and Lieb, 2010; Perotti *et al.*, 2012; Colicchia *et al.*, 2013; Centobelli *et al.*, 2017). To provide an up-to-date and comprehensive framework of GLPs, we leveraged previous contributions, particularly the work by Colicchia *et al.* (2013), which has been adapted and expanded to develop Table 1. The extant literature is summarized by clustering GLPs into nine macro-categories, further grouped into two types, namely "internal" and "external", which are in line with the taxonomies proposed by Zhu *et al.* (2007) and Sarkis *et al.* (2010). Specifically, Distribution Network (re-) Design, Distribution Planning and Transportation Execution, Green Warehousing, Reverse Logistics, Packaging Design and Management, and Internal Management have been labeled as "internal" GLPs, since they usually refer to intra-organizational practices (Perotti *et al.*, 2012), whereas Green Purchasing, Collaboration with Customers, and Other Collaborations have been defined as inter-organizational (i.e. "external") GLPs, since they require commitment and joint goal setting among different players of the same supply chain (Colicchia *et al.*, 2013). For each macro-category, specific categories and GLPs are identified. Please refer to Colicchia *et al.* (2013) for a brief description of the individual GLPs within each of the above-mentioned macro-areas.

Factors influencing GLPs adoption

The adoption of GLPs can be influenced by multiple factors that may accelerate or jeopardize the implementation of GLPs (Marchet *et al.*, 2014). Different studies have addressed factors as either enablers or barriers, depending on the context (Huge-Brodin *et al.*, 2020). Factors can be further distinguished as internal or external, as suggested by Evangelista *et al.* (2017). Internal factors affect processes within the company boundaries, while external factors tackle the decisions made by companies within their supply chain and the network of relationships with customers, suppliers, governments, and institutional bodies. Table 2 summarizes the previous literature by clustering the influencing factors into five main clusters, following what was previously offered by other authors (e.g. Perotti *et al.*, 2012; Marchet *et al.*, 2014; Evangelista *et al.*, 2017).

Economic and financial factors are related to the impact on company profitability (Abbasi and Nilsson, 2012; Centobelli *et al.*, 2017). The economic aspect is usually perceived as a key barrier because the financial benefits of GLPs are often achieved only in the long term, and

Table 1.
Literature overview of GLPs

Type of GLPs	Macro-category	Category	GLPs	Main references
Internal	Distribution Network (re-) Design	Network nodes	No. of distribution tiers, and No. of warehouses per tier	Colicchia *et al.* (2013), Perotti *et al.* (2012), Colicchia *et al.* (2016)
			Facility location	Lieb and Lieb (2010), Jumadi and Zailani (2010)
			Operationalization of urban consolidation centers	Perotti *et al.* (2012), Abbasi and Nilsson (2016), Jazairy *et al.* (2021)
		Transportation mode selection	Use of alternative transportation modes (e.g. intermodal, combined) and modal shift	Ciliberti *et al.* (2008), Lieb and Lieb (2010), Eng-Larsson and Norrman (2014), Centobelli *et al.* (2017), Bask and Rajahonka (2017), Martins *et al.* (2022)
			Multimodal distribution strategies	Lieb and Lieb (2010), Colicchia *et al.* (2013)
	Distribution Planning and Transportation Execution	Fleet design	Use of alternative (green) fuels (e.g. biofuels)	Ciliberti *et al.* (2008), Lieb and Lieb (2010), Centobelli *et al.* (2017), Laguir *et al.* (2021)
			Use of alternative (green) vehicles (e.g. electric)	Lieb and Lieb (2010), Jumadi and Zailani (2010), Centobelli *et al.* (2017), Martins *et al.* (2021a, b), Schiffer *et al.* (2021)
			Reduction of the use of polluting vehicles	Perotti *et al.* (2012), Colicchia *et al.* (2013), Laguir *et al.* (2021)
			Vehicle maintenance and disposal	Perotti *et al.* (2012), Colicchia *et al.* (2013), Laguir *et al.* (2021)
		Eco-driving	Limiting the speeds at which company equipment is operated	Lieb and Lieb (2010), Colicchia *et al.* (2013), Jazairy *et al.* (2021)
		Transportation routing and scheduling	Increase of vehicle utilization rate (FTL)	Centobelli *et al.* (2017), Forslund *et al.* (2022)
			Shipment/freight consolidation	Ciliberti *et al.* (2008), Lieb and Lieb (2010), Colicchia *et al.* (2013), Martins *et al.* (2022)
			Route planning optimization	Lieb and Lieb (2010), Lin and Ho (2008), Jumadi and Zailani (2010), Colicchia *et al.* (2013), Centobelli *et al.* (2017)
			Vehicle idle time reduction	Prataviera *et al.* (2023)
			Backhaul movements balancing	Plaza-Úbeda *et al.* (2021)

(*continued*)

Table 1.

Type of GLPs	Macro-category	Category	GLPs	Main references
	Green Warehousing	Land use reduction	Efficient land use (e.g. brownfield redevelopment, retrofitting)	Murphy and Poist (2000), Colicchia *et al.* (2013)
		Warehouse energy-efficiency	Thermal insulation (e.g. use of recent construction materials able to reduce dispersions, loading docks with insulated doors) and alternative construction materials	Jumadi and Zailani (2010), Rai *et al.* (2011), Ries *et al.* (2017), Perotti *et al.* (2022)
			Energy consumption reduction by means of energy efficient heating and lighting systems that also leverage alternative energy sources and sensors/smart metering	Lieb and Lieb (2010), Ciliberti *et al.* (2008), Lin and Ho (2008), Centobelli *et al.* (2017), Sureeyatanapas *et al.* (2018), Sellitto *et al.* (2019), Perotti *et al.* (2022)
			Water usage minimization	Murphy and Poist (2000), Jumadi and Zailani (2010), Laguir *et al.* (2021)
			Adoption of green/energy-efficient material handling equipment	Jumadi and Zailani (2010), Meneghetti and Monti (2015), Fichtinger *et al.* (2015), Ries *et al.* (2017)
			Operational practices (e.g. Travel distance optimization, Optimal scheduling of material handling activities and battery charging)	Fichtinger *et al.* (2015), Ries *et al.* (2017)
		Green IT	Adoption of IT systems to monitor the environmental performance and guide actions for improvement	Bartolini *et al.* (2019)
	Reverse Logistics	Product Reverse Logistics	Design for recycling	Murphy and Poist (2000), Jumadi and Zailani (2010), Lieb and Lieb (2010), Martins *et al.* (2021b), Plaza-Úbeda *et al.* (2021)
			Improve visibility to allow material separation and achieve more efficient recovery	Martins *et al.* (2021b), Plaza-Ú beda *et al.* (2021)
			Reconditioning or refurbishing used products for logistics	Azevedo *et al.* (2011), Colicchia *et al.* (2013)
		Transportation	Development of synergies between direct flows and reverse flows	Sellitto *et al.* (2019), Plaza-Ú beda *et al.* (2021)

(*continued*)

Table 1.

Type of GLPs	Macro-category	Category	GLPs	Main references
	Packaging Design and Management	Material usage	Packaging design to reduce waste	Azevedo *et al.* (2011), Evangelista (2014)
			Packaging reuse and recycling	Murphy and Poist (2000), Ciliberti *et al.* (2008), Lieb and Lieb (2010), Jumadi and Zailani (2010), Centobelli *et al.* (2017)
			Use of sustainable materials	Azevedo *et al.* (2011), Evangelista (2014), Martins *et al.* (2022)
		Freight load optimization	Reduction of packaging weight and volume	Colicchia *et al.* (2013), Jazairy *et al.* (2021), Laguir *et al.* (2021)
			Shape optimization for shipment	Colicchia *et al.* (2013), Jazairy *et al.* (2021), Laguir *et al.* (2021)
	Internal Management	Environmental sustainability monitoring	Introduction of reporting systems to monitor sustainability goals and their achievement	Azevedo *et al.* (2011), Abbasi and Nilsson (2016), Nilsson *et al.* (2017), Martins *et al.* (2022)
			Definition of sustainable KPIs, environmental targets and priorities	Lieb and Lieb (2010), Nilsson *et al.* (2017), Huge-Brodin *et al.* (2020)
			Research activities and investments for green innovation	Colicchia *et al.* (2013), Abbasi and Nilsson (2016), Sellitto *et al.* (2019)
		Offices and employees	Incentives programs for environmental suggestions by employees	Murphy and Poist (2000), Lieb and Lieb (2010), Martins *et al.* (2022)
			Personnel training to increase awareness	Murphy and Poist (2000), Lieb and Lieb (2010), Colicchia *et al.* (2013), Centobelli *et al.* (2017)
		Supply chain traceability	Purchases tracking through the entire supply chain	Singh and Trivedi (2016), Centobelli *et al.* (2017), Cousins *et al.* (2019)
			Environmental performance measurement at a supply chain level	Singh and Trivedi (2016), Cousins *et al.* (2019), Sellitto *et al.* (2019)
		Publicize environmental efforts	Achieving green certifications	Piecyk and Björklund (2015), Perotti *et al.* (2022)
			Eco-branding	Murphy and Poist (2000), Sellitto *et al.* (2019), Laguir *et al.* (2021)
			Eco-labeling	Sellitto *et al.* (2019), Laguir *et al.* (2021)
		Alignment with company's sustainability strategy	Incorporating sustainability in the company's vision and mission	Azevedo *et al.* (2011), Perotti *et al.* (2012), Colicchia *et al.* (2013), Laguir *et al.* (2021)

(*continued*)

Table 1.

Type of GLPs	Macro-category	Category	GLPs	Main references
External	Green Purchasing	Green sourcing	Adoption of green KPIs in suppliers' selection processes (e.g. contractual environmental goals)	Jazairy and von Haartman (2021), Jazairy *et al.* (2021)
			Controlling suppliers' certifications	Perotti *et al.* (2012), Micheli *et al.* (2020)
			Formalized long-term cooperation with suppliers towards environmental objectives (e.g. by sharing investments)	Sellitto *et al.* (2019), Jazairy and von Haartman (2021)
		Green monitoring	Adoption of green KPIs in suppliers' monitoring	Azevedo *et al.* (2011), Perotti *et al.* (2012), Laguir *et al.* (2021)
			Use of sustainable KPIs in vendor rating	Micheli *et al.* (2020)
	Collaboration with Customers	Customers' engagement in GLPs development	Recovery policies for end products	Colicchia *et al.* (2013), Chu *et al.* (2019)
			Awareness campaigns	Abbasi and Nilsson (2016), Gruchmann *et al.* (2019), Laguir *et al.* (2021)
			Customer's involvement in product design considering environmental requirements	Lieb and Lieb (2010), Perotti *et al.* (2012), Chu *et al.* (2019)
		Data sharing	Cooperation with customers for route planning optimization	Centobelli *et al.* (2017), Chu *et al.* (2019), Jozef *et al.* (2019)
			Web portals to calculate energy and CO2 emissions	Jazairy and von Haartman (2021), Laguir *et al.* (2021)
	Other Collaborations	Collaboration with other stakeholders	Collaboration with product designers and OEMs	Ciliberti *et al.* (2008), Azevedo *et al.* (2011)
			Collaboration initiatives among competitors	Abbasi and Nilsson (2016), Cousins *et al.* (2019)
			Collaboration with public institutions	Cousins *et al.* (2019), Jazairy *et al.* (2021)
			Collaborations with universities and research centers	Colicchia *et al.* (2013)
			Membership in environmental programs with NGOs	Cousins *et al.* (2019)
			Investment sharing	Jazairy *et al.* (2021)

Source(s): Author's own work, adapted and expanded from Colicchia *et al.* (2013)

Macro-category	Influencing factors	Main references (factors as barriers)	Main references (factors as enablers)
Economic and financial	Profitability	Carter and Rogers (2008), Abbasi and Nilsson (2012), Marchet *et al.* (2014), Evangelista *et al.* (2017), Centobelli *et al.* (2017)	Lin and Ho (2008), Centobelli *et al.* (2017)
	Investments	Seuring and Müller (2008), Abbasi and Nilsson (2012), Oberhofer and Dieplinger (2014), Evangelista *et al.* (2017), Tumpa *et al.* (2019)	Lieb and Lieb (2010), Centobelli *et al.* (2017)
	Incentives	Evangelista *et al.* (2017), Tumpa *et al.* (2019)	Centobelli *et al.* (2017)
Organizational	Performance measurement (e.g. control and monitoring activities)	Seuring and Müller (2008)	Abbasi and Nilsson (2016), Evangelista *et al.* (2017), Perotti *et al.* (2022)
	Competence/knowledge/ awareness	Centobelli *et al.* (2017), Tumpa *et al.* (2019)	Lin and Ho (2008), Giunipero *et al.* (2012), Centobelli *et al.* (2017)
	Change management approach (e.g. internal resistance/support to changes)	Seuring and Müller (2008), Abbasi and Nilsson (2012), Evangelista *et al.* (2017), El Baz and Laguir (2017), Tumpa *et al.* (2019), Forslund *et al.* (2022)	Rossi *et al.* (2013), Centobelli *et al.* (2017)
	Reputation/image	Seuring and Müller (2008), Abbasi and Nilsson (2012)	Lieb and Lieb (2010), Perotti *et al.* (2012), Marchet *et al.* (2014), Centobelli *et al.* (2017), Micheli *et al.* (2020), Dai *et al.* (2021), Laguir *et al.* (2021)
Technological	Infrastructure development (e.g. charging infrastructure)	Centobelli *et al.* (2017), Taefi *et al.* (2017)	Schiffer *et al.* (2021)
	Implementation process	Abbasi and Nilsson (2012), Abbasi and Nilsson (2016), Evangelista *et al.* (2017), El Baz and Laguir (2017)	Lin and Ho (2008), Centobelli *et al.* (2017)
	Technological maturity	Abbasi and Nilsson (2016), Centobelli *et al.* (2017), Evangelista *et al.* (2017), Meyer (2020)	Centobelli *et al.* (2020b)
	Technological complexity	Seuring and Müller (2008), Centobelli *et al.* (2017), Evangelista *et al.* (2017), Tumpa *et al.* (2019)	Centobelli *et al.* (2017), Dai *et al.* (2021)
Collaboration	Availability of collaborations along the supply chain	Abbasi and Nilsson (2012), Colicchia *et al.* (2013), Evangelista *et al.* (2017), Tumpa *et al.* (2019), Forslund *et al.* (2022)	Rossi *et al.* (2013), Centobelli *et al.* (2017), El Baz and Laguir (2017), Jazairy (2020), Micheli *et al.* (2020)
	Mutual acknowledgement of efforts and investments	Colicchia *et al.* (2013), Oberhofer and Dieplinger (2014)	Centobelli *et al.* (2017), Dai *et al.* (2021)

Table 2.
Literature overview of the GLPs' influencing factors

(*continued*)

Macro-category	Influencing factors	Main references (factors as barriers)	Main references (factors as enablers)
External	Pressure from suppliers	Evangelista *et al.* (2017), Tumpa *et al.* (2019)	Oberhofer and Dieplinger (2014), Centobelli *et al.* (2017), Liu *et al.* (2019)
	Pressure from customers and their awareness	Colicchia *et al.* (2013)	Lieb and Lieb (2010), Rossi *et al.* (2013), Centobelli *et al.* (2017), Evangelista *et al.* (2017), Huge-Brodin *et al.* (2020), Micheli *et al.* (2020), Dai *et al.* (2021)
	Pressure from competitors	Centobelli *et al.* (2017), El Baz and Laguir (2017)	Lieb and Lieb (2010), Evangelista *et al.* (2017), Wong *et al.* (2018), Micheli *et al.* (2020)
	Pressure from the government and institutions	Perotti *et al.* (2012), Colicchia *et al.* (2013), Hrovatin *et al.* (2016), Centobelli *et al.* (2017), Evangelista *et al.* (2017), El Baz and Laguir (2017), Evangelista *et al.* (2018)	Rossi *et al.* (2013), Centobelli *et al.* (2017), Wong *et al.* (2018), Micheli *et al.* (2020), Kitsis and Chen (2021)

Source(s): Author's own work, adapted and expanded from Perotti *et al.* (2012) and Evangelista *et al.* (2017)

Table 2.

companies fear short term cost increases (Colicchia *et al.*, 2013; Perotti *et al.*, 2022). GLPs also require significant investments, which represent important barriers when dedicated assets must be acquired by companies (Gotschol *et al.*, 2014; Hrovatin *et al.*, 2016). However, they can contribute to reducing operational costs (Oberhofer and Dieplinger, 2014; Giordano *et al.*, 2018). Moreover, the lack of financial incentives appears as another important barrier (Evangelista *et al.*, 2017; Tumpa *et al.*, 2019), with uncertainty about payback times further increasing hesitation about the adoption of GLPs (Tumpa *et al.*, 2019).

Organizational factors concern company culture and internal management. The willingness and capability to develop green initiatives depend on available competences and knowledge (Abbasi and Nilsson, 2012; Giunipero *et al.*, 2012) but also on sustainability awareness (Centobelli *et al.*, 2017) since internal resistance and organizational inertia may occur (Seuring and Mü ller, 2008; Evangelista *et al.*, 2017). Also, the development of performance measurement systems can be important to support monitoring activities and define plans (Perotti *et al.*, 2022). When environmental efforts are public, effective communication can enhance company image and reputation (Perotti *et al.*, 2012; Marchet *et al.*, 2014), thus strengthening sustainability-oriented initiatives (Laguir *et al.*, 2021).

Technological factors include the degree of complexity and the maturity of technological innovations (Evangelista *et al.*, 2017), which may lead to longer time required for implementation (Abbasi and Nilsson, 2016). It could also be a matter of compatibility, as certain technologies could require a change in the equipment that companies already use (Evangelista *et al.*, 2017). A last important factor is infrastructure development (Giordano *et al.*, 2018) as electric vehicles require an adequate distribution of charging stations to enable mass use (Taefi *et al.*, 2017; Schiffer *et al.*, 2021).

Looking at collaboration factors, GLPs need mutual recognition of efforts and investments among companies to be effective (Lieb and Lieb, 2010; Colicchia *et al.*, 2013), including final consumers (Evangelista *et al.*, 2017). Collaborations favor knowledge pooling, and knowledge sharing among companies with heterogeneous background can generate better awareness

and foster new GLPs (Centobelli *et al.*, 2017). However, the lack of participation of supply chain partners can jeopardize the effectiveness of GLPs, discouraging the ideation and adoption of new practices (Marchet *et al.*, 2014; Evangelista *et al.*, 2017) and reducing commitment (Oberhofer and Dieplinger, 2014).

Lastly, external factors summarize the pressures exerted by suppliers (Liu *et al.*, 2019; Tumpa *et al.*, 2019) and competitors, who could, in a mirror-like fashion, increase their interest by equalizing efforts and reputation (Centobelli *et al.*, 2017; Wong *et al.*, 2018). Such pressures do not necessarily involve collaboration but can deeply affect the decisions companies make to develop GLPs. Customer pressure driven by environmental awareness is presented as the strongest factor (El Baz and Laguir, 2017) because having customers willing to pay for environmental sustainability also helps improve profitability (Huge-Brodin *et al.*, 2020; Dai *et al.*, 2021). Government and institutional pressures are also acknowledged as very important factors (Giordano *et al.*, 2018), although regulatory uncertainty is often perceived as a critical barrier (Perotti *et al.*, 2012; Evangelista *et al.*, 2018).

Relevant stakeholders for the adoption of GLPs

When discussing green logistics, LSPs are often considered to be the key players (Jazairy *et al.*, 2021). They are usually deemed accountable for emissions related to logistics operations, even when they act on behalf of their customers (i.e. shippers) (Aronsson and Huge Brodin, 2006; Evangelista, 2014). However, LSPs and shippers have different perspectives on environmental sustainability (Jazairy and von Haartman, 2021). This creates heterogeneous goals and priorities and often leads to poor alignment between offering and requirements (Jazairy *et al.*, 2021). Besides, a multitude of other actors can play important roles in creating environmental sustainability for logistics (Huge-Brodin *et al.*, 2020). This is in line with the stakeholder theory, which defines as a stakeholder "any group or individual who can affect or be affected by the achievements of the firm's objectives" (Freeman, 1984, p. 25). The stakeholder theory discusses how companies should do business while considering the interests of multiple stakeholders (Huge-Brodin *et al.*, 2020). It acknowledges that a plethora of actors can influence companies' externalities, and this includes environmental impact; consequently, it is a popular theoretical lens for sustainability research (Sarkis *et al.*, 2010; Johnsen *et al.*, 2017).

As different stakeholders play different roles, scholars often distinguish between primary and secondary stakeholders according to how they contribute to creating value for the company and whether they are part of its resource base (Post *et al.*, 2002). Primary stakeholders include employees, managers, financiers, suppliers, and customers (Kirchoff *et al.*, 2011). They usually have a stronger influence on focal companies and are generally taken into account before the companies' secondary stakeholders, which include competitors, governments and institutions, local communities and society, technological providers, and final consumers (Freeman *et al.*, 2010; Huge-Brodin *et al.*, 2020). However, companies do not simply respond to each stakeholder individually, and the influences of multiple stakeholders can overlap (Post *et al.*, 2002; Wong and Fryxell, 2004). This highlights the importance of considering multiple supply chain stakeholders simultaneously, and scholars have developed Freeman's original model (1984) to adapt it to a supply chain context (Huge-Brodin *et al.*, 2020). Today, the extent of inclusion of supply chain stakeholders into organizational environmental practices, and the role of specific stakeholders (both primary and secondary) represent important research areas (Ardakani *et al.*, 2022).

Different stakeholders can have either a positive or negative impact on GLPs, and this is related to the heterogeneous pressures, which are important influencing factors in undertaking GLPs (Ahmad and Xu, 2021; Kitsis and Chen, 2021). Community pressures

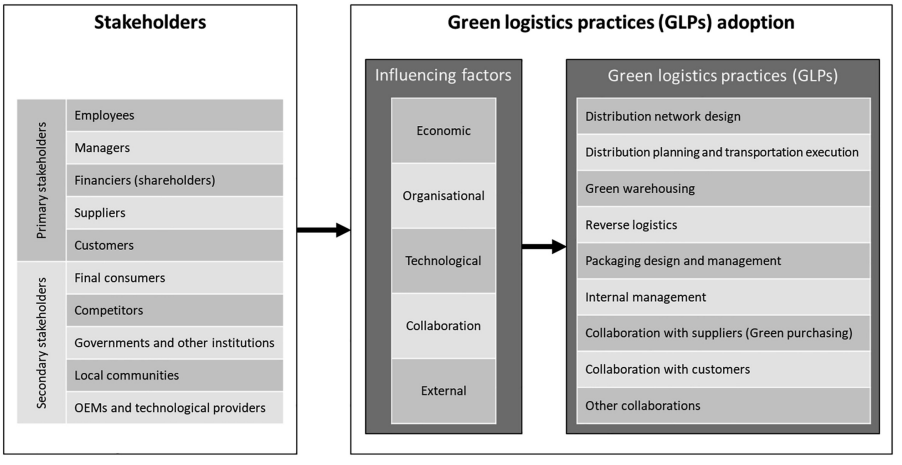
can push companies to align with the evolving regulation frameworks (Micheli *et al.*, 2020). The level of suppliers' awareness about environmental sustainability can also be critical (Gotschol *et al.*, 2014; Evangelista *et al.*, 2017), along with the initiatives undertaken by competitors, which can be problematic to maintain a green reputation (Dai *et al.*, 2021). However, from a stakeholder perspective, final consumers are key actors, since their individual awareness (and commitment) about the problem can improve not only environmental performance, but also the outcome of sales and efficiency (El Baz and Laguir, 2017). Although they usually claim to have high expectations, final consumers are not always willing to pay for better sustainability, and this can undermine the adoption of GLPs (Huge-Brodin *et al.*, 2020). Figure 1 summarizes the extant literature and offers the investigation framework built on the outcomes of the literature analysis (Tables 1 and 2).

Methodology

Research design

To address the identified RQs, we took a qualitative approach and conducted multiple case-study research (Näslund, 2002). Case-study research is suitable for empirically investigating a current phenomenon in its real-life context and is particularly appropriate for exploring a problem concerning different contextual factors (Fawcett *et al.*, 2014; Gammelgaard, 2017). In this study, it enabled us to collect detailed and contextually rich data to elaborate current understanding about how different stakeholders contribute to the adoption of GLPs (Eisenhardt, 1989; Yin, 2014). The research methodology is shown in Figure 2.

A multiple embedded research design was developed (Yin, 2014), choosing GLPs and related influencing factors as embedded sub-units of analysis within larger units of analysis represented by the broader environmental sustainability strategies of the companies. This also allowed us to examine the set of stakeholders involved with the adoption of GLPs. By using multiple case studies, we improved external validity, while a more specific analytical focus on pattern matching and identification of potential causal links helped improve internal validity (Ellram, 1996). A research protocol was developed to guide the empirical phase, including the investigation framework offered in Figure 1 (Yin, 2014).



Source(s): Author's own work

Figure 1.
Investigation framework

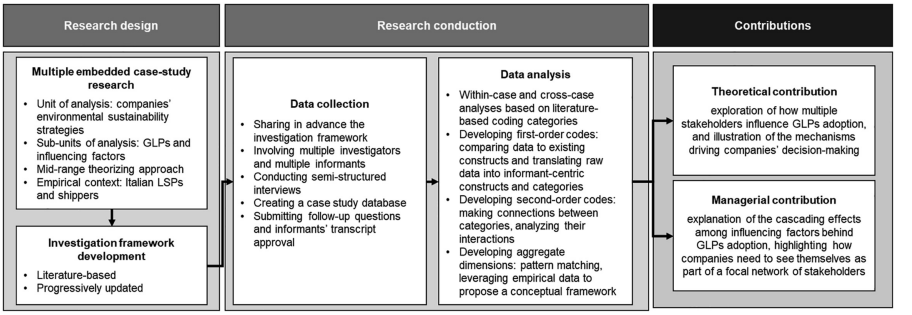


Figure 2.
Research methodology

Source(s): Author's own work

Sample selection

A middle-range approach was adopted, facing the problem given a well-defined research domain (Stank *et al.*, 2017). We focused on the Italian logistics industry, which is one of the largest in Europe with an overall market value of more than €80bn (Prataviera *et al.*, 2021). Moreover, following pressure from regulatory bodies, logistics and transportation companies have recently showed increasing commitment to environmental issues (Colicchia *et al.*, 2013; Evangelista *et al.*, 2017).

The selection of cases and informants was aimed at maximizing conceptual insights and understanding (Eisenhardt, 1989). Heterogeneous and purposeful sampling was applied (Saunders *et al.*, 2009) while considering 13 companies founded in Italy or having a legal entity in the country. We chose large companies (i.e. companies with revenues higher than €50 M), because they are generally more inclined to formalizing and developing environmental sustainability for logistics and thus appeared to be better cases to explore green logistics operationalization. Previous scholars addressed green logistics issues mainly from the perspective of LSPs (e.g. Isaksson and Huge Brodin, 2013; Laguir *et al.*, 2021), sometimes focusing on specific countries (e.g. Perotti *et al.*, 2012; Bahr and Sweeney, 2019). Nevertheless, GLPs can also be developed by shippers (Jazairy *et al.*, 2021). Shippers and LSPs represent different types of actors who operate in different competitive scenarios, and which therefore can develop GLPs with different strategic purposes (Huge-Brodin *et al.*, 2020). In line with recent contributions (e.g. Jazairy *et al.*, 2021), we decided to consider both LSPs and shippers. Organizations were thus clustered as LSPs (LSP.#) and shippers (SH.#) (Table 3).

Data collection

We conducted semi-structured interviews with different types of managers, providing heterogeneous perspectives from different functional domains within companies (Yin, 2014). At least two managers were interviewed for each of the thirteen selected companies. To mitigate observer bias, different investigators were also involved (Voss *et al.*, 2002).

In general, it was important to have respondents who were aware of their company's green actions. The investigation framework was given to participants beforehand, together with Tables 1 and 2 (listing the literature based GLPs and influencing factors in detail), to allow interviewees to prepare adequately. It was accompanied by an interview questionnaire, which is provided in Appendix 1. The funnel model format was adopted, beginning with open-ended questions, and then narrowing the scope with more specific questions (Voss *et al.*, 2002). Each interview was structured along two macro-sections collecting insights about GLPs and related influencing factors. We then developed a third macro-section to explore the impact of individual stakeholders.

Interviewed company	Revenues 2020 (Italy)	FTEs 2020 (Italy)	Interviewee 1 role	Interviewee 2 role	Interviewee 3 role
LSP.1	€ 221 M	1,060	Logistics Manager *(5–10 years)*	Warehouse Manager *(10–15 years)*	
LSP.2	€ 552 M	158	Marketing Manager *(10–15 years)*	Quality Manager *(5–10 years)*	Environmental Manager *(1–3 years)*
LSP.3	€ 290 M	3,600	Marketing Manager *(5–10 years)*	External Relations Manager *(5–10 years)*	Sustainability Manager *(3–5 years)*
LSP.4	€ 815 M	2,100	Logistics Manager *(10–15 years)*	Sustainability Manager *(3–5 years)*	Marketing Director *(5–10 years)*
LSP.5	€ 648 M	2,800	Sustainable Development Manager *(3–5 years)*	Brand Manager *(1–3 years)*	Operations Manager *(5–10 years)*
LSP.6	€ 360 M	1,100	Innovation Manager *(5–10 years)*	Supply Chain Manager *(10–15 years)*	
SH.1	€ 1.5 B	1,688	Supply chain Manager *(15–20 years)*	Transportation Manager *(5–10 years)*	
SH.2	€ 163 M	1,076	Plant Director *(10–15 years)*	Supply Chain Manager *(5–10 years)*	
SH.3	€ 5.6 B	1,300	Leather Good Logistics Director *(5–10 years)*	Supply Chain Manager *(10–15 years)*	
SH.4	€ 938 M	1,829	Logistics Excellence Manager *(5–10 years)*	Logistics Excellence Specialist *(5–10 years)*	Sustainability Manager *(3–5 years)*
SH.5	€ 922 M	1,193	Supply Chain Manager *(10–15 years)*	Sustainable Development Manager *(3–5 years)*	Plant Director *(5–10 years)*
SH.6	€ 15.5 B	65,772	Supply Chain Director *(10–15 years)*	Regional Distribution Manager *(5–10 years)*	Logistics and Customer Service Manager *(1–3 years)*
SH.7	€ 312 M	472	Europe Head of Logistics *(5–10 years)*	Supply Chain Manager *(5–10 years)*	

Note(s): Years of experience in the role for the interviewees are reported between brackets
Source(s): Author's own work

Table 3.
Cases and interviewee details

In total, 26 interviews (2 per case) were conducted online between February 2021 and July 2021; Microsoft Teams was used because of the ongoing pandemic. Interviews lasted approximately 2 h. The second meeting for each case started with a review of the findings and insights from the previous meeting, thus improving the study's construct validity and reliability (Voss *et al.*, 2002). An integrated case study database was created and regularly

updated during the research. This database also included secondary sources like industry reports, news articles, and other available public documents. This increased the study's construct validity (Voss *et al.*, 2002) and improved its practical relevance by directly linking the empirical data with the practical knowledge in the field (Stentoft and Rajkumar, 2018). After each interview, data were homogeneously collected in pre-structured case outlines (Ellram, 1996) through Microsoft Excel spreadsheets. The adoption of a standard format made it easier to position data related to a particular subject within cases and simplified the identification of cross-case considerations. The interviewees received the drafts of notes and the final documentation of each case for their final approval to check the validity and accuracy of the data collected and increase reliability (Yin, 2014).

Data analysis

We first created a list of coding categories leveraging the extant literature (Voss *et al.*, 2002; Yin, 2014), improving internal and construct validity (Voss *et al.*, 2002). Examples of coding categories included GLPs and influencing factors (Perotti *et al.*, 2012; Colicchia *et al.*, 2013; Evangelista *et al.*, 2017), but also pressures from different stakeholders (Kirchoff *et al.*, 2011). Categories were regularly updated after each interview by comparing the evidence collected from the new cases with the available materials and incorporating the emergent insights (Yin, 2014). We first conducted within-case analyses (Eisenhardt, 1989), examining the empirical data to support the literature-based constructs and develop new categories (Ellram, 1996; Yin, 2014). For example, extant classifications of GLPs were reviewed (e.g. to isolate reverse logistics and packaging design and management initiatives). We then developed first-order codes by translating raw data (i.e. informants' words) into more meaningful and higher-level (but still informant-centric) constructs (Gioia *et al.*, 2013). For example, we related the adoption of specific GLPs categories to individual influencing factors. Within-case findings were then compared in a cross-case analysis to enable pattern matching and highlight similarities and differences across the cases (Eisenhardt, 1989). Data were put together in new ways to regroup and link categories to each other in a different manner, allowing individual idiosyncrasies from single cases to emerge and later reconciling them in a broader and more generalizable view (Voss *et al.*, 2002). This led to identifying interdependencies (or cascading effects) across the influencing factors. First-order codes were then summarized into second-order codes, which are more abstract and aimed at describing and explaining the phenomena under investigation (Gioia *et al.*, 2013). This also led to establishing meaningful associations between categories and analyzing their interactions (Yin, 2014). We isolated the impact that different influencing factors have on the overall process of adopting GLPs and highlighted the factors' ambiguity as either enablers or barriers. We also elaborated the cascading effects across factors, which showed how external, organizational, technological, and collaboration factors strongly affect the economic ones. We collected extensive evidence about the cascading effects in Appendix 2, while summarizing its main findings in Table 5, which indicates the involved primary and secondary stakeholders for each influencing factor, along with other potential factors originally affected by the stakeholders in focus.

Data were further elaborated to connect cross-case evidence with the previous theory to integrate the emerging findings into a cohesive whole (Ellram, 1996). This led to contextualizing the role played by the wide set of stakeholders that emerged from the cases with respect to the previously identified influencing factors and link them to the adoption of GLPs. We thus developed further aggregate dimensions (Gioia *et al.*, 2013), which informed the development of a conceptual framework (Figure 3). First- and second-order codes and aggregate dimensions are described in the data structure proposed in Appendix 3, which illustrates and summarizes how we progressed from raw data to constructs and themes during the analysis (Gioia *et al.*, 2013).

Findings

Factors influencing GLPs adoption: enablers or barriers?

In exploring how influencing factors affect the adoption of GLPs, our empirical investigation highlighted contrasting views about the role played by these factors, illustrating how the same factor could be either enabler or barrier depending on the context (Table 4).

Economic and financial factors are mainly acknowledged as barriers to the adoption of GLPs. Investment costs are often considered a strong barrier to any GLP (LSP.2, LSP.3, LSP.4, LSP.6, SH.3, SH.4, SH.5, SH.7), although the supply chain managers of SH.1 and SH.7 both acknowledged that "all major businesses have the resources to drive an environmental action, so if there is the desire to perform any initiative in the first place, it is developed". Moreover, some initiatives show interesting profitability when they allow for a significant reduction in operational costs (e.g. using electric vehicles to save on fuel purchasing; LSP.3, SH.1). Overall, the existence of governmental incentives is crucial to enable the adoption of GLPs (LSP.4), but their uncertainty over time is highly critical (LSP.1, LSP.6, SH.5). The lack of an adequate and certain incentive program is often seen as an unsurmountable barrier (LSP.6), even when GLPs can encompass a significant reputation/image benefit. However, this latter factor is a powerful enabler, associated with potential higher revenues, as customers might be ready to pay a premium price for green products and services (LSP.3).

Macro-category	Influencing factors	Barrier	Enabler
Economic and financial	Profitability		LSP.3, SH.1
	Investments	LSP.2, LSP.3, LSP.4, LSP.6, SH.3, SH.4, SH.5, SH.7	
	Incentives	LSP.1; LSP.6; SH.5	LSP.4
Organizational	Performance measurement (e.g. control and monitoring activities)		LSP.5
	Competence/knowledge/awareness	SH.2, SH.5, SH.6	LSP.3, LSP.6, SH.4, SH.7
	Change management approach (e.g. internal resistance/support to changes)	LSP.2	LSP.3, LSP.4, LSP.5, SH.3, SH.7
	Reputation/image		LSP.3, LSP.4, LSP.5, SH.3, SH.4, SH.5, SH.7
Technological	Infrastructure development (e.g. charging infrastructure)	LSP.1, LSP.4, LSP.6	
	Implementation process	SH.7	
	Technological maturity	SH.3	
	Technological complexity	LSP.1, LSP.3, LSP.4, LSP.5, SH.1	
Collaboration	Availability of collaborations along the supply chain	LSP.1	LSP.4, LSP.5, LSP.6, SH.2, SH.3, SH.5, SH.6
	Mutual acknowledgement of efforts and investments	LSP.1, SH.3	LSP.4, LSP.5, SH.7
External	Pressure from suppliers		
	Pressure from competitors		LSP.2, LSP.5
	Pressure from customers (and their awareness)	LSP.5, SH.6, SH.7	LSP.1, LSP.2, LSP.3, LSP.6, SH.3, SH.5
	Pressure from governments and institutions	LSP.5, LSP.6, SH.3	LSP.4

Source(s): Author's own work

Table 4. Impact of influencing factors across the examined cases

Organizational factors are generally considered relevant enablers (SH.3, SH.4), and organizational culture is often perceived as an enabler, although inertia toward changes can be a very strong barrier (LSP.2). Companies with a strong and diversified knowledge base often have open approaches to experimenting with new solutions (LSP.3, LSP.6, SH.4, SH.7). When companies lack adequate knowledge and competences about GLPs, internal resistance is higher and the workplace can be hostile to their adoption (SH.2, SH.5, SH.6). For example, companies struggle to enlarge the green perspective if the workforce is not sensitive to the argument (LSP.2). Therefore, a well-communicated environmental strategy is highly important (LSP.4, LSP.5, SH.5, SH.7). The introduction of performance measurement systems is important to strengthen control and monitoring activities (LSP.5), also helping the development of environmental competences. This in turn can increase awareness and foster the accumulation of new knowledge (LSP.3, LSP.6, SH.4, SH.7), which promotes an open environment (LSP.3, LSP.4, LSP.5, SH.3, SH.7).

Technological factors are significant barriers to the adoption of GLPs. The two main technological barriers are the maturity and the complexity of different technologies (LSP.1, LSP.3, LSP.4, LSP.5, SH.1). For example, infrastructure development is critical for electric vehicles, whose autonomy is limited with respect to fossil fuel ones (LSP.1, LSP.4, LSP.6). However, SH.7 highlighted that the implementation process could also be problematic in terms of time and competences needed, e.g. to develop reliable traceability systems.

Differently, collaboration factors are often perceived as enablers and the availability of collaboration initiatives along the supply chain can be powerful (LSP.5, LSP.6, SH.3, SH.5, SH.6). The creation of an open environment that permeates and joins different actors can enable GLPs that otherwise no individual player could have afforded (LSP.5, SH.6). Such collaborations can involve universities and research centers (LSP.4; SH.3) but also suppliers (SH.2) or start-ups (LSP.6). However, the mutual acknowledgment of efforts and investments is critical (LSP.1, SH.3). When companies fail to agree on sharing costs, benefits are missed (SH.7). Therefore, in developing a supply chain culture that is prone to environmental sustainability, overcoming the differences of individual actors can determine the success or failure of GLPs (LSP.4, LSP.5).

Lastly, external factors relate to pressures coming from suppliers, competitors, final consumers, and governments. None of the interviewees suggested suppliers' pressure as a significant factor, but "the differentiation from competitors can be an important element to strengthen our position in the supply chain" (Marketing manager – LSP.2). Competitors' pressure can be a powerful driver, moving laggards to follow the leading examples and develop GLPs to imitate them (LSP.5). However, the pressure exerted by final consumers is offered as the most important enabler both by LSPs and shippers (LSP.6, SH.3, SH.5). As reported by the SH.6 supply chain director, "today there is insufficient pressure from final consumers to push companies towards the development of GLPs." The pressure from final consumers is fundamental to raise interest and accelerate the adoption of GLPs (LSP.1, LSP.2), but it is often related to their willingness to pay a premium price for environmentally sustainable products and services (LSP.5, SH.6). This positively influences the entire supply chain because if consumers are willing to pay more, shippers could afford higher rates from LSPs without compromising profitability (SH.7). On the other hand, LSPs that serve only efficiency-oriented customers perceive this factor as a strong barrier, since it limits their capability to develop GLPs. There is indeed a strong relationship between external and economic factors, which extends to government and institutional pressures. The lack of standards and clear regulations are seen as major constraints related to the external environment (SH.3). This also relates to the uncertainty about future incentives (LSP.5 and LSP.6), but a better definition of the standards to be assessed and short-term objective setting for the industry would improve the clarity of the path to take (LSP.4).

Factors influencing GLPs adoption: the effect of relevant stakeholders

Our investigation delved deeper in exploring how relevant stakeholders can impact the influencing factors (which in turn affect the adoption of GLPs). Results highlight that developing environmental sustainability for logistics involves changing not only operational processes, but also internal management and external collaboration approaches. This encompasses that multiple stakeholders are involved and can impact on the factors influencing GLPs adoption.

First, workforce and employees emerged as key stakeholders to boost organizational factors and build a strong environmental culture within the companies (LSP.2, LSP.3, SH.4, SH.6). Raising awareness about the topic is crucial, and many companies developed specific training programs (LSP.2, LSP.6, SH.2). However, the support of managers is critical because the lack of adequate knowledge and competence can generate resistance instead of driving power (SH.2, SH.5, SH.6). This also concerns the technological factors. Companies need to acquire new competences also to manage the growing technological complexity – which can be a daunting task for both LSPs and shippers (e.g. LSP.1, LSP.3, LSP.4, LSP.5, SH.1, SH.7). Technological factors can help the same company to develop GLPs, but the same technology can hinder the effort of the LSPs to work with suppliers if they do not have the same technology or are not equipped to deal with it or they don't have the competences to work with that technology (e.g. SH.7). In this context, "technology providers play a fundamental role in making the technology more implementable from a technical viewpoint" (LSP.6). The maturity level and potential of available technologies is constantly increasing, together with lower costs, as compared to the past. However, significant issues remain (mostly due to range capacity) and this is particularly critical for technologies like the electric power supply, with issues related to vehicle range and charging infrastructures (which depend on the private initiative as well as on the support from public institutions).

Moreover, our cases emphasized the importance of collaboration and the involvement of supply chain partners such as suppliers and customers. Both LSPs and shippers (LSP.5, LSP.6, SH.3, SH.5, SH.6) acknowledged that collaboration factors push companies to break the silos and avoid the adoption of merely internal GLPs that can be developed only in isolation, reducing the potential to have also good return on investments in terms of economic outputs (e.g. LSP.5, SH.6).

On the suppliers' side, some companies started requiring a mandatory minimum percentage of green vehicles in suppliers' fleets (LSP.1, LSP.3, SH.6). As claimed by supply chain director of SH.6, "our carriers must use vehicles that are at least EURO 4 pollution class (or above)." LSPs often monitor suppliers' environmental performance, setting targets and working with their partners to reach the defined goals. However, LSPs also acknowledged that their suppliers (i.e. carriers) must sustain significant expenses to update their fleets. LSP.1 and LSP.4 financially supported those suppliers who work exclusively for them, while SH.6 agreed on higher rates due to sustainability expenses but also obtained discounts related to efficiency improvements. However, some LSPs (e.g. LSP.1, LSP. 3) highlighted a reluctance on the shippers' side to contribute to green logistics investments.

Conversely, the collaboration with customers is not well developed although customers emerge as important stakeholders to develop collaborations. Only LSP.4 cooperates with a specific customer in a joint investment in electric vehicles, while LSP.4 and LSP.6 proactively proposed GLPs to customers but asking for an economic recognition of such efforts. However, other collaborations can be significant, as some companies collaborate with universities and research centers to introduce certified performance measurement systems (LSP.4, SH.2, LSP.6) or created an internal task force to pursue research and development activities (LSP.5). This kind of initiative not only provides companies with external qualifications, but also strengthens internal processes regarding data collection and data analysis (SH.6).

Collaboration could also involve start-ups commercializing electric vehicles and trucks, who could introduce to the market innovative solutions (LSP.6).

Finally, with regards to the external factors, the adoption of GLPs appears to be linked to the clarity (LSP.4), consistency (SH.3) and reliability/volatility (LSP.5 and LSP.6) of evolving government regulations. From the collected evidence it emerges that companies are prevented from extensively investing in GLPs because the uncertainty of governments' policies (LSP.2, LSP.3; SH.5, SH.7). Companies are wary of the high investments required to adopt GLPs and the uncertain payback times they create, being highly concerned about the availability of incentives and resulting profitability (LSP.4, LSP.6, SH.3, SH.4). Besides the institutional and governmental side, competitors can be important to illustrate successful examples, which companies perceive as opportunities to strengthen their position (e.g. LSP.2) or imitate initiatives (LSP.5). Furthermore, customers and consumers are important stakeholders (LSP.6, SH.3, SH.5) affecting external factors, because they can raise interest to and accelerate the development of GLPs (LSP.1, LSP.2). However, efficiency-oriented (or sustainability-unaware) customers and consumers can hinder the adoption of GLPs because of their cost and service priorities competing against the environment (LSP.5, SH.6, SH.7). Companies highlighted a rising awareness about environmental sustainability and explained that markets, regulations, and disposition of LSPs towards such alternatives have evolved in recent years. However, they also highlighted that reducing environmental impact is necessarily subordinated to cost efficiency and economic factors are still considered predominant compared to others (e.g. LSP.1, LSP.3, LSP.4, LSP.5, and SH.4).

Discussion

Internal and external influencing factors affecting the adoption of GLPs

Regarding how influencing factors affect the adoption of GLPs, companies often make claims about their willingness to improve environmental sustainability. However, economic and financial factors lead to adopting a limited number of practices. Most of the suggested actions require structural investments that often only wealthy corporations can undertake (Hrovatin *et al.*, 2016). Switching to a green paradigm requires a deep renewal of the logistics assets, which also encompasses a redefinition of the cost-quality trade-off (Colicchia *et al.*, 2013).

The way companies see and interpret the pushes or the obstacles to the adoption of GLPs seems to depend on organizational factors too (Micheli *et al.*, 2020), and specifically on the organizational culture (which is very much related to the corporate strategy) and the support of the top management. Companies need to develop an organizational culture that acknowledges the importance of environmental matters to turn sustainable strategies into practice (Abbasi and Nilsson, 2016). In our study, organizational culture and top management support were identified as main enablers for green development, but the way they affect the adoption of GLPs turns into barriers when companies lack adequate knowledge and competences (Giunipero *et al.*, 2012; Evangelista *et al.*, 2017). The lack of long-term commitment is another critical issue, with companies often preferring short-term operational "quick fixes" (Evangelista *et al.*, 2017; Jazairy *et al.*, 2021).

The way technological factors affect the adoption of GLPs is also quite complex and can be a two-faced issue to be confronted by organizations. First, the adoption of GLPs based on technology is strongly affected by organizational factors (Evangelista *et al.*, 2017; Marchet *et al.*, 2014). As also highlighted by Evangelista (2014), it is worth mentioning that issues related to technological factors have also been related to the compatibility and suitability of a certain technology with the IT systems and processes already in place.

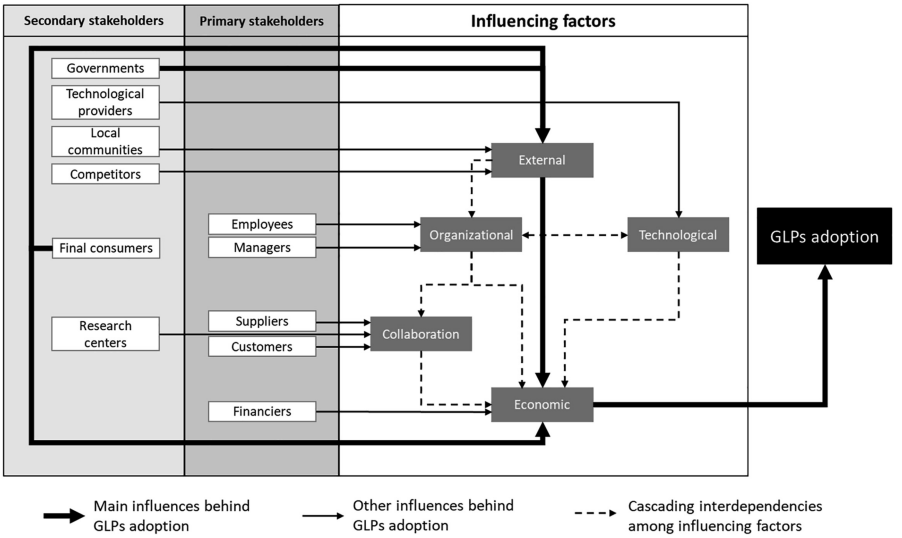
Moreover, both LSPs and shippers activated collaborations to share resources and information with different actors and overcome the lack of competences regarding sustainability (Jazairy *et al.*, 2021). This fosters the adoption of GLPs, confirming what

previously suggested by Abbasi and Nilsson (2012) and Gotschol *et al.* (2014). However, some LSPs highlighted a reluctance on the shippers' side to share the economic responsibility of green logistics investments. Therefore, whether collaboration factors can enable (or hinder) the adoption of GLPs depends on the development of an organizational culture prone to openness and to recognize the importance of sustainability (Jazairy *et al.*, 2021).

Finally, external factors have become critical issues for many companies (Marchet *et al.*, 2014). Even though the standards set at an institutional level do not represent a constraint *per se*, the lack of clear and well-defined environmental regulations and financial incentives is perceived as a fundamental barrier, in line with Giunipero *et al.* (2012). Well-defined regulations can be a powerful enabler for the future but are heavily dependent on specific countries and jurisdictions (Gotschol *et al.*, 2014; Bahr and Sweeney, 2019; Dai *et al.*, 2021). Besides the institutional and governmental side, external factors affect the adoption of GLPs through the pressure from competitors (Rossi *et al.*, 2013), which some sample companies perceive like an opportunity to strengthen their position or imitate initiatives. If competitors decide to turn green, inevitably followers within the industry are driven to develop GLPs themselves (Lieb and Lieb, 2010; Centobelli *et al.*, 2017).

Stakeholders' impact on the influencing factors behind the adoption of GLPs

According to the evidence collected, stakeholder pressure seems to stem mainly from economic and financial factors. However, it seems to emerge that they depend on other influencing factors, which leads to infer that single influences cannot be examined *per se* (Huge-Brodin *et al.*, 2020). This also underscores the need to adopt a multi-stakeholder perspective that goes beyond primary stakeholders (Wong and Fryxell, 2004). As acknowledged by our interviewees, the relevance of secondary stakeholders is increasing and sometimes even stronger than that of primary stakeholders. In addition, it appears that the influence of the different factors works through a series of "cascading effects", hereinafter explained (see Figure 3).



Source(s): Author's own work

Figure 3.
Overview of the cascading effects among factors and the influence of the relevant stakeholders

To appreciate the essence of the above-mentioned cascading effects, in Appendix 2 we link each GLP adopted by the sampled shippers and LSPs with relevant influencing factors and related stakeholders exerting an effect on the aforementioned factors. This information has been summarized in Table 5, where we re-organized our findings around the primary and secondary stakeholders who are directly and indirectly involved for each macro-category of influencing factors.

	Primary stakeholders	Macro-category originally affected by the stakeholders	Secondary stakeholders	Macro-category originally affected by the stakeholders
Economic factors				
Investments	Managers	Organizational	Tech providers	Technological
	Financiers	Economic	Governments	External
Profitability	Managers	Organizational	Governments	External
Incentives	Managers	Organizational	Governments	External
Customers' willingness to pay	Customers	Collaboration	Final consumers	External
Unclear cost and profit-sharing mechanisms	Customers	Collaboration	Final consumers	External
	Suppliers	Collaboration	Final consumers	External
	Managers	Organizational	Final consumers	External
Organizational factors				
Culture and awareness	Managers	Organizational	Final consumers	External
	Employees	Organizational	Final consumers	External
Knowledge and competences	Managers	Organizational	Governments	External
	Employees	Organizational	Governments	External
Technological factors				
Infrastructure development	Managers	Organizational	Governments	External
Technological complexity	Managers	Organizational	Tech providers	Technological
	Employees	Organizational	Tech providers	Technological
Collaboration factors				
Availability of collaborations	Suppliers	Collaboration	Research Centers	Collaboration
	Customers	Collaboration	Research Centers	Collaboration
Mutual acknowledgement of efforts and investments	Managers	Organizational	Governments	External

Table 5.
Cascading effects: influencing factors and involved stakeholders

Source(s): Author's own work

From the evidence that has been gathered, it appears that external factors such as government regulations, customers' requirements, and competitors' choices and offerings affect the adoption of GLPs, but also influence other factors (Sarkis *et al.*, 2011). In fact, the way governments set environmental policies, green incentives, and regulations (also in terms of clarity about the "rules of engagement", as stated by the interviewees) affects how the

economic influencing factors are seen by organizations and drive their actions towards investments in GLPs.

Concerning economic factors, primary stakeholders (such as financiers and shareholders) hold the keys to overcoming the investment barrier. Secondary stakeholders (like governments and institutions) can deeply facilitate the funding process and push towards the adoption of practices for compliance reasons (in line with Dai *et al.*, 2021). Nevertheless, LSPs and shippers have different approaches and priorities (Jazairy *et al.*, 2021). Our investigation confirmed that LSPs are keen to introduce GLPs, but their actions depend on the willingness of logistics buyers to economically support them. Jazairy and von Haartman (2021) and Huge-Brodin *et al.* (2020) found that few shippers are willing to contribute economically. Conversely, the shippers interviewed in this study appeared interested in contributing to efforts promoted by LSPs. This could be explained by the increased awareness about climate issues in recent years. However, shippers also recognized that insufficient understanding of purpose and actions prevents them from sharing initiatives with LSPs and other stakeholders. Case findings illustrate that major companies have the resources to engage for the creation of GLPs, but the mutual economic acknowledgment of efforts and investments between shippers and LSPs is critical.

The economic factor is also affected by less obvious stakeholders, such as final consumers, who can help overcome the investment barrier by recognizing a premium price to the environmental efforts of focal organizations (Jazairy and von Haartman, 2021). However, it is critical to note that multiple tiers of supply chains involve different types of customers who can have different impacts. Nowadays, considering only direct customers is misleading. This is not a novelty for academia (Huge-Brodin *et al.*, 2020), but this study shows how final consumers deeply affect the adoption of GLPs for both LSPs and shippers. For example, final consumers affect the need for LSPs to adopt logistics network configurations to fulfill the demand for e-commerce services. This can drive strong demand for fast shipping (with the introduction of urban distribution centers, possibly compensated for by adopting green vehicles for urban deliveries). Therefore, secondary stakeholders generate a trade-off for LSPs between consolidating orders to reduce the environmental impact of transportation (by increasing the average drop size) and meeting their customers', but also final consumers' needs in terms of speed, agility, and flexibility of the transportation services (which leads to fragmenting shipments and reducing the average drop size). Our evidence expands the view of Dai *et al.* (2021) about how customers' requirements have a positive relationship with GLPs, highlighting instead the prominent role of final consumers. Although they are normally acknowledged as secondary stakeholders, they are important stakeholders, not only for their direct suppliers (i.e. shippers), but also for their suppliers' suppliers (e.g. LSPs).

The external factors also shape the development of organizational elements. Acknowledging the importance of environmental matters is viewed as the outcome of a permeating influence that stems from the cultural and social environment companies operate in and which shapes the organizational side of the company (e.g. to conform to regulatory requirements, or to respond to the approaches and initiatives of competitors). Companies are revisiting their organizational settings to pursue better operational performance that eventually leads to better environmental performance (e.g. planning for fewer trips, consolidation of loads, changing the packaging to reduce waste and costs), driven also by the influence of primary (internal) stakeholders such as managers and, to a lesser extent, employees (in line with Kitsis and Chen, 2021). As organizational factors directly relate to companies' internal strategies, they are the steppingstone to the development of an environmentally oriented organizational culture which goes beyond the search for better operational performance.

Furthermore, organizational factors can influence the adoption of technology to improve environmental (and ultimately economic) performance. Organizational factors can be a lever for better technological readiness towards the adoption of GLPs rather than a barrier (Ahmad and Xu, 2021). However, technology suppliers/providers play a fundamental role in making

the technology more accessible also from an economic viewpoint and more implementable from a technical viewpoint, e.g. developing common and shared interfaces which empower stakeholders to adopt, accept, and implement technology.

Organizational factors also shape how companies address collaboration in terms of cultural and managerial approaches. They influence the option to open to collaboration by engaging with suppliers or customers (potentially leveraging funding opportunities), with the goal of getting price recognition from customers and final consumers. Hence, they link back to the economic factors. However, if it is acknowledged that collaboration can lead to overcoming financial barriers (Centobelli *et al.*, 2017), organizations must develop first a supply chain culture that is prone to environmental sustainability, overcoming the differences of individual actors. Our evidence shows that collaboration with suppliers is somewhat developed, even though it seems more driven by compliance (especially for vehicles specifications) than by the development of innovative managerial solutions. Conversely, collaboration with customers is very limited. Since collaboration factors are perceived as enablers of GLPs, we highlight that it is fundamental to leverage external stakeholders, such as universities, research centers, and trade associations (Centobelli *et al.*, 2020b). This can facilitate a reciprocal sharing of collaboration opportunities with a pool of partners that can play the role of trustees in driving the mutual acknowledgement of efforts and investments (Abbasi and Nilsson, 2016). As different stakeholders can develop different degrees of awareness, promoting joint GLPs is critical to increase and align the overall awareness (Huge-Brodin *et al.*, 2020), thereby triggering a virtuous cycle. Moreover, the economic effort of environmental sustainability is not evenly felt, and the costs are more difficult to bear for some stakeholders than others. Collaboration favors knowledge pooling and positively contributes to addressing the problem in a spirit of fairness, leading to rising awareness and decreasing costs, and thereby bolstering the development and adoption of GLPs.

Conclusions

As logistics activities can harm the environment amid a global climate emergency, companies will more and more likely be required to minimize such effects (Carter and Rogers, 2008; Huge-Brodin *et al.*, 2020). To understand how to improve the current approaches to adopting GLPs - which scholars have identified as inadequate (Sweeney *et al.*, 2018) - we designed multiple embedded case studies to elaborate stakeholder theory on the collected empirical findings. We adopted a middle-range approach, offering a contribution to the extant knowledge about developing environmental sustainability in logistics and across supply chains in a well-detailed empirical context which involves LSPs and shippers in Italy.

Theoretical contributions

In this study, we explored how different factors influence GLPs adoption and developed the current understanding about how these could act as enablers or barriers to environmental strategy. We elaborated on previous contributions (e.g. Abbasi and Nilsson, 2012; Perotti *et al.*, 2012; Evangelista *et al.*, 2017) by analyzing empirical evidence through the lens of stakeholder theory and adopting a multi-stakeholder perspective. We illustrate how shippers and LSPs should understand the complex set of influencing factors driving the outcomes of their decision-making process when adopting GLPs.

We highlight how multiple stakeholders can interact to transform factors into either enablers or barriers, contributing to stakeholder theory with an analysis of the pressures exerted by a wide range of actors. For example, the lack of specific measurement standards,

regulations, and incentives negatively impacts the decisions companies make to introduce GLPs, thereby emphasizing the important role of governments and institutions. If this represents a barrier today, governments are expected to increasingly introduce penalties for non-sustainable operations, so it is also highlighted as a strong enabler for the adoption of GLPs in the near future. However, it is not sufficient to have government policies to bolster environmental sustainability if the final consumers are not willing to recognize GLPs investments by LSPs and shippers, and our study highlights the fundamental role played by final consumers to motivate the adoption of GLPs.

By identifying factors that can act as barriers or enablers to companies' sustainability strategies, we also illustrate the importance of the interdependencies between primary and secondary stakeholders to foster concrete actions towards the adoption of GLPs. For example, we illustrate how economic factors are influenced by obvious stakeholders (like financiers) but also less obvious ones as final consumers. However, this study also highlights that companies still prioritize economic factors over any others when deciding about GLPs adoption, but then deepens how these factors must be combined with external factors such as the incentives and regulatory frameworks provided by governments and institutions.

Managerial implications

By discussing the role of stakeholders affecting the adoption of GPLs and the related influencing factors, our paper also contributes to improving the prospects for companies that want to embed environmental sustainability in logistics and across supply chains. We elaborated literature contributions with real-world insights, proposing actionable knowledge for practitioners, providing an answer to the "understanding into action conundrum" raised by Sweeney *et al.* (2018). Despite the many public claims for engagement, GLPs adoption is still insufficient (Centobelli *et al.*, 2020b; Sharma *et al.*, 2023). Due to increasing pressure from institutions, governments, and consumers, GLPs adoption is expected to increase. This overall attitude attests to a rising green awareness on the part of companies, as previously attested by Evangelista *et al.* (2017). However, future efforts are required to go beyond mere compliance with government regulations (Sureeyatanapas *et al.*, 2018) to keep pace with the ever-evolving operating environment that LSPs and shippers must face.

If the economic factors seem to drive the decision-making process, we explain how they are in turn affected by a mixture of internal (e.g. organizational) and external (e.g. technological) factors. We believe that the view of these cascading effects can help in making sense of stakeholders' pressures on the influencing factors that prevent or support the adoption of GLPs by shippers and LPSs, suggesting companies where they could focus their attention to concretely improve and increase GLPs adoption. Moreover, our findings highlight that companies still approach the environmental sustainability matter in logistics by mainly considering the stand-alone firms. However, our analysis clearly depicts a scenario where the adoption of GLPs is not a choice determined by single organizations (either shippers or LSPs) because the influence of several factors affects their ability or approach to adopting GLPs in a cascading way. To address the climate urgency shippers and LSPs can no longer afford to address GLPs as stand-alone "focal companies" but must see them as part of the "focal network of interconnected stakeholders" that they are part of.

This puts companies in a situation where they should engage with primary and secondary stakeholders using a network approach, rather than focus only on "point-to-point" dyadic actions that have the focal company as pivot of the GLP initiatives. This is also well represented by the need for organizations to work not only on the institutional side (e.g. engaging with governments and financiers), but also concurrently on the supply chain side (i.e. suppliers, customers, and especially final consumers).

Limitations and future research avenues

Looking at the boundaries of the research, we adopted a middle-range approach which considered a limited sample of companies within the Italian context. Enlarging the scope could increase the generalizability of the results, since the relevance and the perception of the influencing factors and pressures could vary depending on the context taken as the basis of analysis. For example, the available literature did not examine GLPs for different types of LSPs and suggests that GLPs are often relevant when companies own logistics assets. However, future studies could review GLPs adoption distinguishing among different types of LSPs (e.g. third-party logistics service providers, freight forwarders, haulers) and according with their specific activities/offerings.

This study could also stimulate further investigations concerning the use of the stakeholder theory to bolster environmental sustainability in logistics. For example, testing could be done on the relationships we identified between stakeholders and various influencing factors, and the combined effect on the adoption of GLPs. Research findings could be further developed by carrying out a survey study which could allow for pursuing statistical generalization and potentially provide normative guidelines to the different stakeholders engaged in the sustainability transition.

Moreover, this study did not examine the potential interdependencies emerging from the adoption of different GLPs. These interdependencies might have important implications (e.g. introducing measurement systems could raise internal awareness, potentially leading to implementing further GLPs), and we suggest this as a promising research area for the future. We suggest empirical research based on approaches like Interpretive Structural Modeling (ISM), which could shed light on the interrelationship between specific variables and the related driving power.

Lastly, future studies could adopt an explicit longitudinal perspective to investigate the timeframes for the adoption of GLPs and explore its evolution over time. This could also be significant in the wake of the change of the competitive scenario emerging from the Covid-19 pandemic. Logistics was hugely affected by the lockdowns that followed the pandemic's outbreak, and customer expectations evolved and shifted due to resulting shortages (e.g. in the grocery industry). Customers might change their expectations in the case of abrupt disruptions, prioritizing individual survival and product availability over the environmental sustainability of the supply chains behind them. As the pandemic could provide only a foretaste of what could happen after a climate-driven global disruption, we believe future studies could explore the related implications more profoundly.

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Appendix

The supplementary material for this article can be found online.

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