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A Qualitative Analysis of Social Indicators in Highly Polluting Sectors: The Challenge for Multifaceted Standards in Emerging Economies

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ABSTRACT

The institutional current effort to regulate and increase the quantity and quality of sustainability information reported by companies is undeniable. However, the growing complexity of sustainability reporting standards creates isolated compartments for each major dimension of sustainability, leaving aside their interconnectedness and combined impacts. Indeed, highlighting the social impact of environmental issues requires a different approach, based on multifaceted indicators, which the current reporting standards fail to provide. This paper proposes a tool to measure and report on the social impacts of environmental issues, based on the Social Life Cycle Assessment (S-LCA). Choosing the freight transport sector as a transversal industrial sector linked to high environmental risks and social impact in terms of pollution, we perform a case study with representative companies, applying the S-LCA methodology to assess the multifaceted social impacts of the sector in three different countries from three different continents, presenting particular socio-economic and cultural conditions. Through in-depth communication with the sector stakeholders in every country, we conclude that social indicators linked to the freight sector activity are not reflected in standard reporting, nor adjusted to the stakeholders' needs. Contributions of this study are relevant to scholars, policymakers, and practitioners with several recommendations for management practice related to the perceptions of social indicators when addressing the interests of various stakeholders in different countries, according to their priorities and business mindset.

1 | Introduction

The evolution of companies towards more sustainable business models requires specific environmental strategies to facilitate the transition towards zero-emission production (Scarpellini et al. 2017). Decisions regarding corporate sustainability pose a significant dilemma for managers, weighing social and environmental concerns against economic results (Cintra and Carter 2012), while institutional pressure on firms increases due to resource policy frameworks and regulations for material resource efficiency (Zeng et al. 2017). Therefore, firms must manage their dual mission, integrate social and environmental goals into their business model, and incorporate accountability mechanisms (Nigri and Baldo 2018; Pesci et al. 2020).

The so-called guidance SEEA-2003 (United Nations et al. 2003) of the System of Integrated Environmental and Economic Accounting (SEEA) focuses on the economic and environmental areas of sustainable development, leaving aside the social aspect (Dietz and Neumayer 2007). However, through the years, the rating agencies and scholars have turned their attention to a more holistic approach, putting the focus on the environmental and social pillars (Muñoz-Torres et al. 2019), while companies find a growing interest in promoting socially friendly activities

and measuring their impact through different social performance methods (López-Arceiz et al. 2018).

While reporting on sustainability initially developed through flexible and heterogeneous models, the Global Reporting Initiative (GRI) has emerged as the dominant standard for corporate sustainability communication (GRI 2022; KPMG 2020). However, despite its widespread adoption for reporting environmental, social, and governance (ESG) impacts, it often compartmentalises these dimensions. This segmentation results in an underrepresentation of the complex social consequences that arise from environmental issues, particularly in high-impact sectors such as transportation.

In particular, the ability to measure multifaceted social impacts is expanding through tools like social life cycle assessment (S-LCA), which aim to integrate stakeholder perspectives across the supply chain and product life cycle (UNEP/SETAC 2009). However, the relevance and materiality of social indicators are strongly context-dependent, varying by country, institutional capacity, and socio-economic development (Osei et al. 2025; Wyrwa et al. 2023).

To empirically explore the social consequences of environmental impacts across diverse institutional, cultural, and developmental contexts, this study focuses on transport companies in three countries (Spain, Colombia, and Malaysia) selected for their contrasting yet complementary characteristics. Spain represents a mature Western European economy with well-established sustainability frameworks, providing a robust baseline. In contrast, Colombia and Malaysia are upper-middle-income economies with distinct socio-cultural systems and governance models (UNDP 2018, 2024), emblematic of Latin American and Southeast Asian regions, respectively. These regions face well-documented institutional asymmetries, labour informality, and heightened vulnerability to environmental health risks (ASEAN 2019; Brunori et al. 2023; OECD 2024; WHO 2016; Yap 2014) Similar comparative approaches have also been applied in cross-national environmental policy research, such as the analysis of wetland management in Senegal, India, Spain, Colombia, and Malaysia, which highlights common socio-ecological challenges and underscores the need for community-based strategies across different institutional and environmental contexts (ELAW 2022).

The freight transport sector in all three countries shares comparable environmental profiles but exhibits different stakeholder expectations and reporting capacities, making them suitable for cross-national S-LCA. Their selection was also shaped by pragmatic factors such as data accessibility, language compatibility, and collaborative networks with local stakeholders, which are essential for implementing S-LCA studies (Osorio-Tejada et al. 2019; UNEP/SETAC 2009). This design enables a comparative understanding of how pollution-related social impacts are perceived, prioritised, and reported across diverse socio-political contexts. Further details for the country selection rationale as case studies are presented in section 3.2.

The research on sustainability reporting has equally gained attention over the years, and it is currently one of the main subjects of research in accounting journals. The theoretical approaches used in these studies are diverse, but among them, the stakeholders, legitimacy, and institutional theories stand out (Meutia et al. 2021). Different studies on sustainability reporting have addressed its drivers and motivations (Adams 2002; Bebbington et al. 2009; Owen 2008), its contents (Unerman et al. 2010; Unerman and Zappettini 2014) or the managers' engagement (Adams and Larrinaga-González 2007). Indeed, the managers' engagement and involvement in sustainability reporting bring in their motivation to do so and, therefore, the internal materiality of information.

In this regard, materiality is essential to the main purpose of reporting and the design of standards such as the GRI, as a key stage in the sustainability reporting process (Farooq and de Villiers 2019). Targeting the stakeholders' needs, the materiality of reported information has been widely studied (Chen et al. 2015; Font et al. 2016; Garcia-Torea et al. 2020). Looking at managers' needs, however, the path to design and implement indicators providing material information that is beneficial for the company is still to be drawn. Some authors have studied the obstacles found by companies to measure sustainability material issues, such as lack of clarity in GRI definitions (Machado et al. 2021), insufficient level of understanding (Slacik and Greiling 2020), or the different ways in which managers institutionalise reporting (Farooq and de Villiers 2019). As stated by De Villiers et al. (2022), organisations focus more on complying with GRI indicators rather than considering the practical meaning of the standards. Indeed, firms should manage their dual mission, integrating social and environmental goals in their business model, and incorporating accountability and reporting mechanisms (Nigri and Baldo 2018; Pesci et al. 2020).

Whatever the case, it becomes clear that companies make economic profit and social benefit, but they also generate social and environmental harm for that same society for which they should be accountable (Siltaoja 2014); their social impacts must be measured and reported. Nevertheless, determining the materiality boundaries of 'social impacts' in the framework of Elkington's triple bottom line (TBL) has long been part of the attempts to develop social and environmental accounting (SEA), as a subsystem of the conventional accounting system (Gray 2002), which would support sustainability reporting.

The growing number of environmental requirements established by the international climate change agreements has led to a body of literature focused on the green initiatives adopted by private companies operating in different sectors and their impacts, in particular in manufacturing industries, energy plants, and the transport sector. However, the social impacts of such initiatives, whether positive or negative, are frequently ignored in favour of purely environmental indicators. Furthermore, those initiatives tend to have an impact on jobs, ancillary activities, labour conditions, or community wealth, among others, which should be considered material and reported accordingly.

In line with these developments, Afshari et al. (2022) adopted a sectoral perspective and studied the Social Sustainability Indicators (SSIs) that can be applied to the energy sector and, more specifically, to the energy supply chain, concluding that there is no consensus on the definition of SSIs, nor on the

way to measure them. In this line of thought, Aznar-Crespo et al. (2021) developed a methodological proposal to assess social impact linked to flood disasters based on a Social Impact Assessment (SIA) approach, while Birkmann et al. (2022) studied how to validate indicators for human vulnerability to climate change on a global scale. The geographical perspective has been studied by Wyrwa et al. (2023) focusing on sustainable energy development and sustainable social development in the EU countries. Even though the EU countries are subject to similar socio-cultural trends, business practices, and legislation, the research showed significant differences in the way social indicators were perceived and reported. Similarly, Osei et al. (2025) concluded that there is a limited understanding of how national regulatory frameworks and cultural-economic contexts influence companies' adoption of sustainable practices, largely due to the scarcity of cross-national empirical comparisons.

Sustainability assessment frameworks are increasingly expected to integrate both environmental and social considerations. Yet, designing useful multifaceted indicators that link social impacts to major environmental concerns remains challenging, especially across countries with differing governance systems, labour market structures, and regulatory capacities. While Western European countries benefit from consolidated institutions and stakeholder engagement, developing regions often face institutional asymmetries, socio-economic inequality, and heightened environmental health risks (Brunori et al. 2023; WHO 2016; Yap 2014). These contrasts highlight how regional contexts shape how companies perceive, prioritise, and communicate sustainability issues.

Those different conditions may present different scenarios in terms of risk and resilience, and how companies and stakeholders perceive the threat and report about it. Responsibility over Climate Change or natural disasters is not equally perceived or attributed to in different countries, making it harder to develop specific, multifaceted indicators for companies' reporting (the second research objective of this study).

However, pollution, including air, soil, and water contamination, is clearly understood as a global concern, being a particularly important case depicting the gap in multifaceted information. As a worldwide concern, relevant to companies all over the world and with diverse and serious social consequences, measuring and reporting on the multifaceted impacts linked to pollutant sectors may reveal how the different practices applied for social accounting and reporting in different continents and organisations (Esposito and Antonucci 2022) fail to provide managers and stakeholders with material information (third research objective).

From this premise, and looking to bring in new insights for current and future development of reporting standards (both at the institutional and business level), this study aims to define specific metrics that help extend the study of social impacts linked to major environmental issues at a global scale.

To the best of our knowledge, there is a notable gap in the study of indicators for social impact of pollution, particularly in regard to applying specific, meaningful, and reliable multifaceted indicators to measure the actual social impacts of highly polluting sectors across the world. Based on these considerations, and looking for a highly polluting sector that is transversal to most countries, with no significant technological differences and with similar activity and relevance within the business arena, we have chosen to study the freight transport sector.

Thus, this research is structured in three main research objectives that aim to contribute to scholars and practitioners about effective metrics to evaluate the social dimension of environmental critical sectors, particularly the highly polluting ones, expanding the concept of double materiality in corporate sustainability reporting and reporting frameworks. Firstly, by studying the potential of expanding the study of social indicators and its implications beyond the standards and conventional metrics commonly used by companies, multifaceted indicators are developed and applied through the lens of Social LCA, tailored for comparative application as a contribution to practitioners. Secondly, our research contributes to highlighting the relevance that social and business culture in different regions of the world has over the perception of Climate Change and natural disasters, thus influencing their significance and presence in reporting for stakeholders. Thirdly, as a combination of the previous two contributions, this research helps practitioners and scholars understand how the different practices applied for social accounting and reporting in different continents and organisations may contribute to the lack of material information for managers and stakeholders.

2 | Background

2.1 | Social Accounting and Sustainability Reporting

The frameworks extensively used to report on social aspects come from sustainability reporting standards, such as the GRI, performance standards specifically focused on social aspects, such as the Social Accountability International (SA8000), or guidance standards, aiming at supporting companies in integrating and implementing their CSR policies, such as ISO26000. While GRI includes a set of standardised social indicators, the SA8000 is focused on complying with principles and good practices linked to working conditions under the companies' sphere of influence.

Within this context, the current reporting standards have an important margin of development in integrating indicators capable of encompassing the multifaceted aspects of social impacts linked to corporate environmental management (Figure 1).

Some authors argue that TBL reports make a more balanced perspective of organisational wealth visible and outline the importance of extended performance accounting (Nigri and Baldo 2018). Thus, sustainability accounting needs specific tools to analyse and evaluate the multifaceted company performance: the environmental-economic performance, the socio-economic performance, and the environmental-social performance (Chvatalová et al. 2011). In addition, a socio-environmental

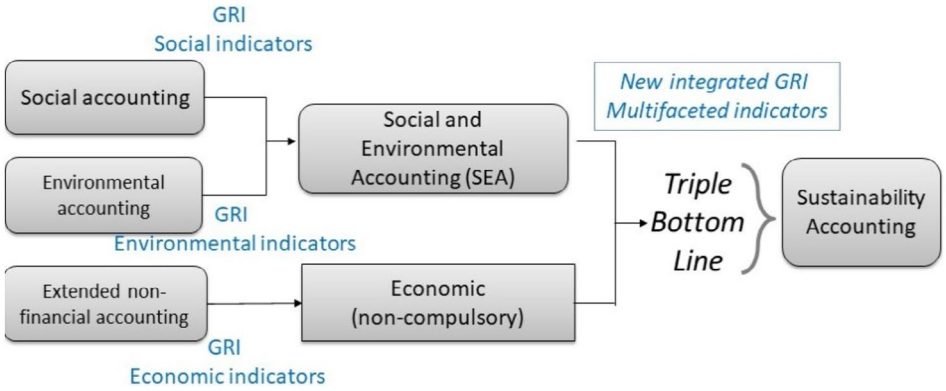

FIGURE 1 | Analysis framework scheme. [Colour figure can be viewed at wileyonlinelibrary.com]

performance would represent a more socially focused vision, which is still understudied within sustainability reporting literature.

CSR plays an important role in shaping sustainability reporting and social impact assessment practices (Sharma and Sathish 2022). It provides a framework for organisations to manage their social, environmental, and economic responsibilities. As highlighted by Esposito and Ricci (2016) CSR is a key driver of transparency and accountability, enabling businesses to align their operations with broader societal goals.

In this framework, it should be argued that the main objective of social accounting, which is to provide systematic information about social risks and opportunities, is not properly reflected in the social measurements of standards such as GRI by using conventional indicators as evidence of the social impact. In fact, there is an increasing requirement to adopt a performance measurement and reporting approach that includes social impact assessment (SIA) models based on social accounting and audit (Nigri and Baldo 2018).

The GRI framework to select social indicators is frequently failing to be useful and applicable for social measurements, by not offering integrated metrics to report, which leads companies to substitute them with common sense (Baumann et al. 2013) corporate sustainability orientation, stakeholders' expectations, or specific context motivations (Boukherroub et al. 2015; Gualandris et al. 2015). As pointed out by Kühnen and Hahn (2017), without standardisation, the social information provided may become incomparable and useless, resulting in little likelihood of implementing socially responsible solutions. To be useful and complete, the measurement of social performance must be extended beyond the boundaries of the company, including impacts during all stages of the corporate supply chain and product life cycle (Blass and Corbett 2018; Isaksson et al. 2010).

Although GRI indicators are standard and clear, they do not focus on guiding the company's measurement of social performance, nor on assessing its impact along the product life cycle (Kühnen and Hahn 2017). In this respect, we define a first research question to analyse how the S-LCA tools could offer an extended and integrated measurement of the socio-environmental aspects required to report the industrial activity (RQ1), which could be inspirational for future developments of the sustainability reporting standards.

2.2 | SOCIAL-LCA as a Tool for Social Accounting and Reporting

More recently, a new approach to assess the social impacts of a product along its life cycle and supply chains has been proposed, following the environmental dimension example and the adoption of the Life Cycle Assessment (LCA) as a significant tool to measure impacts. Indeed, for the social dimension, an S-LCA would help systematise the process of measuring impacts and select effective and useful indicators. Sustainability accounting does not seek to measure profit and financial position but to give a basis for professional judgements about a company's risks and opportunities related to the resources used (Fagerström et al. 2016). It takes a long time from when raw materials are taken up from the ground to when the company's products are sent to the 'grave'. The entire life cycle has to be included in the social impact assessments and, therefore, S-LCA can be a tool for material reporting despite some limitations in methodically identifying pertinent stakeholders and materiality issues pointed out by Huang et al. (2024).

S-LCA representation of the social dimension is part of a broader Life Cycle Sustainability Assessment (LCSA), together with LCA for the environmental dimension and Life Cycle Costing (LCC) for the economic dimension (Neugebauer et al. 2015). With a similar structure to LCA and LCC, the guidelines for S-LCA are compatible with those for LCA included in ISO 14044 (UNEP/SETAC 2009), and those for LCC (Swarr et al. 2011), bringing in a coherent and homogeneous system to measure sustainability-related impacts. This common ground facilitates the definition and application of consistent system boundaries for the three dimensions (Neugebauer et al. 2015), while different targets co-exist, bringing in three different perspectives of the same system (Wood and Hertwich 2013) and allowing for trade-offs between them (Heijungs et al. 2010).

Since the publication of the S-LCA Guidelines by UNEP/SETAC (2009), numerous frameworks and characterisation models have been developed to assess the social impacts of products globally across various industries (Subramanian et al. 2018). The UNEP/SETAC guidelines suggest six categories

for social impact: (1) Human rights, (2) Working conditions, (3) Health and safety, (4) Cultural heritage, (5) Governance, and (6) Socio-economic repercussions.

However, because these impact categories can be very general and abstract, UNEP/SETAC further defines the need to analyse two groups of sub-categories: one group related to the previous six impact categories and the other related to stakeholders (workers, consumers, local community, society, and other actors in the value chain). Furthermore, these guidelines propose 31 social impact sub-categories to be evaluated as well as a classification related to the stakeholders affected by each sub-category (Table 1).

In addition to the methodological guidance for the development of S-LCA, the life cycle initiative publishes the methodological sheets for sub-categories in S-LCA (UNEP/SETAC 2013), recommending a number of indicators and sources of information, among which the review of sustainability or CSR reports is suggested. Despite considering similar indicators, CSR focuses on data collected at the managerial level that has an impact on the local community, while the S-LCA also incorporates process-level data that is internal to the organisation and affects its workers. Furthermore, S-LCA analyses this data within the behaviour of companies involved in the value chain of the product, service, or organisation evaluated.

TABLE 1 | Classification of social impact sub-categories by stakeholder.

Stakeholder	Impact sub-category
Workers	Freedom of association and collective bargaining
	Child labour
	Fair salary
	Working hours
	Forced labour
	Equal opportunities/Discrimination
	Health and SAFETY
	Social benefits/social security
Consumers	Health & safety
	Feedback mechanism
	Consumer privacy
	Transparency
	End of life responsibility
Local community	Access to material resources
	Access to immaterial resources
	Delocalisation and migration
	Cultural heritage
	Safe & healthy living conditions
	Respect of indigenous rights
	Community engagement
	Local employment
	Secure living conditions
Society	Public commitments to sustainability issues
	Contribution to economic development
	Prevention & mitigation of armed conflicts
	Technology development
	Corruption
Value chain actors	Fair competition
	Promoting social responsibility
	Supplier relationships
	Respect of intellectual property rights

Largely preferred by companies, the GRI current standard presents 19 main social indicators, of which two (413 and 414) focus on the potential negative effects of the companies' operations in the community and suppliers. In both cases, the environmental dimension is considered rather general and only as a reporting recommendation. For instance, in recommendation 2.2.3 of GRI indicator 413–2, the standard recommends describing the intensity, duration, reversibility, and scale "for each of the significant actual and potential negative economic, social, cultural, and/or *environmental* impacts on local communities and their rights" (GRI 2022). Besides being a minor and rather open connection between the social and environmental dimension, it does not point out the social consequences of the environmental issues, but only to the potential environmental impacts on local communities. Thus, a second research question would be desirable for this study, focused on how companies could assess and report the social consequences of their environmental impacts, perhaps as a specific set of indicators that could be considered 'multifaceted' (RQ2).

In this sense, the GRI faces the challenge of integrating new multifaceted indicators that refer to the social side of environmental impacts, measured through the life cycle tools, as a complementary boundary for social accounting and reporting.

2.3 | Social Indicators for Sustainability Reporting in Polluting Sectors

Providing a background with different perspectives of social impacts is a complex task, particularly in the framework of *accounting for social sustainability* (Lukka and Vinnari 2014), since data are scarce and not easily integrated into robust evidence to influence policy and practice. The authors refer to it as 'domain theories' in the field of accounting for social sustainability, aimed at developing specific sets of knowledge on the substantive areas underpinning accounting for social sustainability.

In the last two decades, the GRI has demonstrated its application for sustainability reporting, and some of the largest corporations (and small companies) base their reports on accountability practices set by the GRI (KPMG 2020). In particular, polluting sectors make a significant effort to comply with the common environmental standards set by the GRI. However, there is a need to align with the convergence of standards raised internationally, as pointed out by Papoutsi and Sodhi (2020), who revised the application of social sustainability indicators for reporting and the related sustainability performance. Thus, it is expected that the CSRD will force companies to implement non-financial reporting systems based, among others, on the EMAS and the

GRI standards that are still used, as Feor et al. (2023) reveal in a literature review on the common practices for measuring social impacts.

However, in some highly polluting sectors, such as the freight transport and logistics industry, this topic of research is still underdeveloped, and there is not yet a structured framework of analysis (Centobelli et al. 2020). In fact, there is no comprehensive framework for measuring the social impacts of sectoral green and conventional operations from the perspective of the individual freight transporter in terms of compliance with reporting requirements. On the other hand, the supply chain's environmental impacts and subsequent social consequences have not been studied from the reporting perspective. As a representative case study, this paper addresses these gaps by targeting the freight transport sector and its social impact within and beyond its boundaries.

The S-LCA could be considered a tool to measure freight services' social impacts, facing different stakeholders in the emerging process of harmonising non-financial reporting. Indeed, the measurement and reporting of social impacts directly related to the companies' activities should respond, in the first place, to the stakeholders' expectations (Scarpellini 2022), and only then to standardised frameworks. In case the latter are too rigid or not sufficiently developed to address all relevant information, they should not be taken as the only reference to inform about social impacts, but as a partial framework requiring further indicators such as those produced by the S-LCA.

In this paper, we assess the social impacts of a sector highly connected to environmental issues, such as the freight transport sector, through three case studies located in rather different geographical areas in terms of economic, cultural, social, and environmental context. As a third research objective, this study aims to provide a transversal view of the social measurement and reporting (RQ3). While the three countries can be considered representative of their respective continent in terms of development, wealth, and technological advancement of their economies, the proposed analysis is especially significant for companies in emerging economies (Dissanayake 2020), which could apply the outcomes of this research to their own strategies.

3 | Methods

3.1 | Social-LCA Methodology

In order to analyse the relevance and scope of different social indicators used in the freight transport sector, the application of the S-LCA methodology is tested through three case studies based in different geographical, socio-economic, and cultural contexts.

The transport sector, a high-polluting industry due to its significant greenhouse gas emissions, air pollution, and resource depletion, accounts for 24% of global CO_2 emissions (IEA 2019; IPCC 2021; UNEP/SETAC 2009). Freight transport alone contributes approximately 10% of total global emissions, making it a major source both within the transport sector and globally. As freight accounts for nearly half of transport-related emissions, its role in environmental and social impacts is particularly significant. In addition, freight transport generates notable social impacts such as effects on worker health and safety, community well-being, and road safety (ILO 2017). It was selected for this study due to its dual environmental and social relevance, as well as its measurable impacts across diverse socio-economic contexts. It has to be taken into account that S-LCA needs to remain flexible in its adaptation to different conditions, such as technological advancement, education levels, and the environment (Pollok et al. 2021).

This research aims at highlighting the social indicators capable of fully addressing the social impacts derived from the environmental activities of companies, thus expanding the scope and range of sustainability reporting indicators, in line with the results of broader research for the integrated S-LCA applied to freight transport services (Osorio-Tejada et al. 2019).

The methodology was based on the UNEP/SETAC guidelines (UNEP/SETAC 2009), which analyse the social performance across different social impact categories and stakeholders for companies involved in each transport system. Given the high environmental impact of the sector, the inventory analysis was performed for the transport companies and their direct suppliers, such as truck manufacturers, fuel producers, and road construction companies, which are also responsible for environmental and social impact. This methodology follows the four phases described in the ISO 14044 standard for LCA (International Organization for Standardization 2006) goal and scope definition, inventory analysis, impact assessment, and result interpretation. Consequently, inventory analyses were performed for a series of three social indicators for each selected impact sub-category (Table 2), which were based on the list of indicators suggested in the UNEP/SETAC methodological sheets for sub-categories in S-LCA (UNEP/SETAC 2013). The impact assessment was then applied to obtain social performance indexes (SPIs) for each transport system, and the interpretation of results and recommendations were detailed for each case study.[1]

To support the inventory analysis phase, primary data were collected using a mixed-methods approach. Questionnaires were addressed to managers of the freight companies, and semi-structured interviews were conducted with different stakeholder groups (workers, clients, local community, society, and value chain actors such as suppliers or public authorities). Stakeholders were identified through a combination of purposive, snowball, and expert-targeted sampling strategies. Initially, local academic and institutional partners facilitated access to relevant actors using a snowball approach, where initial contacts referred additional participants with expertise or lived experience relevant to the case. However, to ensure balanced representation across stakeholder categories, we also employed targeted outreach to specific individuals based on their roles or institutional affiliations. For example, instead of conducting multiple interviews with individual drivers, we contacted leaders of truck drivers' unions or associations to capture the collective perspective of workers. Similarly, for community and societal stakeholders, we directly contacted individuals occupying representative positions, such as city council members, religious leaders, journalists, or regional

TABLE 2 | Social indicators for the specific inventory analysis in S-LCA of transport.

Social impact sub-category	Indicators
Child labour	Existence of child labour related to the company and conditions in which it is presented Initiatives of the company to reduce child labour Codes of conduct related to the selection of suppliers
Exploitation/forced labour	Reports of existence of forced labour attributed to the company Initiatives of the company to prevent exploitation or forced labour Codes of conduct related to the selection of suppliers
Equal opportunities/discrimination	Reports of discrimination cases in the company Gender diversity in the company and in the sector and initiatives for inclusion and diversity Policies and/or codes of conduct related to the selection of suppliers
Freedom of association	Existence of unions in the company Respect and importance given to union members Codes of conduct related to the selection of suppliers
Fair wage	Average salary and extra-legal benefits Average salary in the city of operation of the company Average salary in the sector and in the country
Fair work hours	Average hours worked per week Flexible schedule Rest week day
Health and safety at work	Non-fatal accident rate Rate of non-fatal accidents in the sector Evidence of occupational health and safety programmes or bad practices regarding these issues
Social benefits/social security	Social benefits granted to employees Labour stability/ease of promotion Codes of conduct related to the selection of suppliers
Transparency in social/environmental issues	Existence and transparency of sustainability reports of the company Clear information on impacts and risks of products/company through sustainability reports Codes of conduct related to the selection of suppliers
Confidentiality with customer information	The company informs the policies of treatment of personal data Mechanisms for information security or campaigns for the respect and protection of personal data Evidence of bad practices in the protection of customer data
Feedback mechanisms with clients	Communication channels available to the client Customer satisfaction indexes reported by the company Relevance given to complaints in the decisions of the company
Delocalisation and migration	Reports of illegal land appropriation and relocation of people attributed to the company Mechanisms to integrate immigrant workers in the community Codes of conduct related to the selection of suppliers
Respect for local traditions/cultural heritage	Reports affecting the cultural heritage attributed to the company Initiatives to safeguard local traditions Codes of conduct related to the selection of suppliers
Respect for the rights of indigenous communities	Policies and initiatives to protect the rights of indigenous communities Conflicts of land or resources with the indigenous people Codes of conduct related to the selection of suppliers
Community involvement	Evidence of community participation in company decisions Evidence of exclusion, restriction, and persecution of community groups Support for community initiatives

(Continues)

TABLE 2 | (Continued)

Social impact sub-category	Indicators
Safe and healthy living conditions	Reports of affectation to the safety and health of the community attributed to the company Efforts to improve the health and safety of the community by the company Codes of conduct related to the selection of suppliers
Access to material resources	Investments to improve the material resources used by the community Evidence of impact on the quality, availability, or prices of material resources attributed to the company Codes of conduct related to the selection of suppliers
Access to intangible resources	Efforts to promote education or health programmes by the company Limitation or repression of the opinions of employees or the community Codes of conduct related to the selection of suppliers
Creation of local employment	Policies for hiring local staff and local suppliers Proportion of locally hired workers Proportion of locally hired management-level workers
Contribution to the national economy	Productivity per worker Average productivity per worker in the sector Percentage of expenses of national suppliers
Prevention and mitigation of armed conflicts	Reports of support in the formation or escalation of conflicts and level of conflict in the area of operation programmes or policies for the prevention or mitigation of conflicts Codes of conduct related to the selection of suppliers
Technological development	Investment reports on research and development, training, and use of modern technologies Presence of obsolete and inefficient technology in the company Predisposition to innovation and technology transfer
Corruption	Reports of the company's involvement in corruption cases Programmes or policies to prevent and control corruption Codes of conduct related to the selection of suppliers
Public commitment on sustainability issues	Public reports of goals or commitments of the company to improve environmental and social aspects Annual change in spending on environmental and social issues Presence of negative behaviours in the face of commitment to sustainability issues
Relations with suppliers	Reports of bad practices with its suppliers such as pricing, non-payment, and irregular orders Collaboration reports between company and suppliers for the sustainability of their businesses Average age of relations with its suppliers
Unfair competition	Reports of participation of the company in unfair competition practices Commitment to avoid unfair competition in the sector or agreements that affect customers Codes of conduct related to the selection of suppliers

environmental directors, as shown in Table 3. This strategy prioritised the credibility and contextual insight of each respondent over sample size per group, ensuring that each perspective reflected institutional or sectoral expertise relevant to the freight transport context. To mitigate potential bias and enhance data validity, confidentiality was assured throughout the process to ensure honest participation.

To ensure the reliability and representativeness of stakeholder responses, each participant was asked to complete a structured self-assessment of their knowledge using a standardised competence coefficient (k), based on Equation (1).

$$k = 1/2\left(k_c + k_a\right), \text{with } 0 \le k \le 1 \quad (1)$$

Here, k_c represents the expert's self-assessed knowledge coefficient, where stakeholders selected a score from 0 to 10, representing complete ignorance and full knowledge, respectively, then divided by 10 (e.g., a score of 8 equals $k_c = 0.8$). The argumentation coefficient, k_a, was calculated from responses to a

TABLE 3 | Stakeholders interviewed in the three countries.

Stakeholder	Subgroup of interest	Interviewee roles across countries
Workers	Employee	Employee drivers leader of company worker's union
	Self-employed/drivers association	Freelance truck driver, president of truckers' association, member of the association of freelance truckers
Clients	Client	Supermarket manager, head of logistics for a supermarkets chain, director of clothes factory
Local community	Public administration/ community group	City councilman, city council mobility advisor, religious community leader
Society	Financial/bank organisation	Business banking executives, manager of bank branch
	Media	Journalist in national TV news, journalist and content manager in TV news, journalist and writer
Other actors	Business association	Director of socio-economic studies in chamber of commerce, logistics, transport and infrastructure business advisor, editor of trucking magazine
	Transport company	Transport company manager, owner and director of transport company, transport company manager
	Auto-parts and maintenance supplier	Regional director wholesaler automotive spare parts/owner of auto-parts retail store, engineer in maintenance workshop
	Education/research	University professor on territorial environment, university professor on territorial planning, university professor on environmental issues
	Environmental corporation	Director of regional environmental licenses, head of area in hydrographic confederation, director in sustainability certification board

5-level rubric evaluating five sources of argumentation criteria: analytical ability, contextual knowledge, motivation to work with stakeholders, theoretical knowledge, and empirical experience. The weights for each item ranged from 0.00 to 0.20 (i.e., 0 = 00; 1 = 0.04; 2 = 0.05; 3 = 0.12; 4 = 0.16; 5 = 0.20); and k_a was the total sum of selected weights. A minimum competence level of $k \geq 0.75$ was used to validate inclusion (Cruz Ramírez and Caridad Martínez Cepena 2012).

To validate the internal consistency of the responses, we applied Cronbach's Alpha, a statistical measure used to assess how reliably a set of survey items measures a common construct. Specifically, we used paired comparisons of social impact sub-categories, allowing participants to rank their relative importance. Each set of responses was analysed for inter-item correlation, and Cronbach's Alpha was calculated using the standard Equation (2).

$$\alpha = \left[k / (k-1)\right] \times \left[1 - \left(\Sigma \sigma_i^2 / \sigma_t^2\right)\right] \quad (2)$$

Here, α is Cronbach's Alpha, k is the number of items, σ_i^2 is the variance of each individual item, and σ_t^2 is the total variance of the summed scale. Higher values of α (closer to 1.0) indicate greater internal consistency. Values above 0.7 were considered acceptable for exploratory studies, while lower values indicated the need to review or revise individual items.

In the impact assessment phase, the results were calculated by combining the data from the three indicators of each sub-category, obtaining scores from 0 to 10, starting from a baseline score of 5, based on the positive or negative findings. Subsequently, the results were normalised into scales from 1 to 5: (1) red, very negative; (2) orange, negative; (3) grey, neutral; (4) blue, positive; (5) green, very positive. This normalisation was performed to facilitate comparability with other S-LCA studies that utilised simplified scales, such as the five-label Product Social Impact Assessment (PSIA) method (Fontes et al. 2016) or the four-label scale employed in the Subcategory Assessment (SAM) method (Ramirez et al. 2014). Stakeholder viewpoints for each impact sub-category were triangulated by comparing interview responses, questionnaire data from the companies, and relevant secondary sources. When results differed by more than two normalised scale points, the items were reviewed for consistency and context, helping to reduce reporting bias and enhance the robustness of the assessment.

The decision to initially use a scale from 0 to 10 in our case studies was motivated by its greater flexibility, which allows for finer differentiation of companies' performance. Additionally, this approach aligns better with the feedback from stakeholders during the first interviews, as respondents often struggled to classify performance within a five-label scale. For instance, they found that some social performances were neither fully neutral (3) nor positive (4) but required an intermediate value. This challenge has also been noted by some authors, such as Rafiaani et al. (2020), who identified the need to introduce additional sub-labels between the standard four levels in the SAM method to capture more precise results in their case study. Results were aggregated into five more general impact

TABLE 4 | Characterisation results for the case studies in Colombia (a), Spain (b), and Malaysia (c).

Impact sub-category	Truck manufacturing			Fuel production				Road construction			Transport company		
Case study	**(a)**	**(b)**	**(c)**	**(a)[a]**	**(a)[b]**	**(b)**	**(c)**	**(a)[c]**	**(b)[c]**	**(c)**	**(a)**	**(b)**	**(c)**
Child labour	6	7	7	9	9	8	7			9	5	6	5
Forced labour	5	7	7	8	8	8	6			8	5	5	5
Equal opportunities	5	6	7	5	7	9	6			7	4	4	4
Freedom of association	3	7	6	5	5	9	6			6	5	7	5
Fair salary	9	5	5	10	5	10	10			6	4	8	4
Fair work hours	6	8	8	3	5	10	4			6	5	5	7
Health and safety at work	7	5	6	9	8	9	8			5	6	6	4
Social benefits	6	6	7	9	9	7	8			9	6	7	6
Transparency in social issues	8	9	7	10	8	9	6			4	3	6	3
Confidentiality customer info	7	7	8	8	7	8	7			7	6	6	6
Feedback mechanisms	9	7	8	9	8	9	7			10	6	8	7
Delocalisation and migration	5	7	6	6	5	6	6			7	5	5	5
Respect for local traditions	6	5	6	6	6	8	7			8	5	5	7
Respect for indigenous rights	5	5	5	7	5	7	6			7	5	5	5
Community involvement	6	6	5	8	6	10	6			7	7	5	6
Healthy and safe living	4	5	8	4	6	8	7			7	5	7	6
Access to material resources	7	6	9	8	5	8	9			8	5	5	5
Access to intangible resources	7	6	8	8	7	9	7			7	5	6	5
Creation of local employment	6	3	5	10	9	6	6			9	9	7	8
Contribution to economy	6	6	7	10	10	7	8			8	7	7	5
Prevention of armed conflicts	7	6	6	7	6	6	5			5	3	5	5
Technological development	8	10	10	7	8	10	8			7	4	8	3
Corruption	6	7	8	3	7	9	7			9	4	5	7

(Continues)

TABLE 4 | (Continued)

Impact sub-category		Truck manufacturing			Fuel production			Road construction			Transport company		
Case study		(a)	(b)	(c)	(a)[a]	(a)[b]	(b)	(c)	(a)[c]	(b)[c]	(c)	(a)	(b)	(c)
Commitment on sustainability		9	7	7	8	8	7	6			5	5	5	5
Suppliers' relationship		8	6	6	8	7	8	5			5	6	7	6
Unfair competition		6	5	6	5	4	4	6			6	7	6	5
Average score	(1 to 5 scale)	3.57	3.52	3.74	3.92	3.74	4.22	3.68	2.85	3.65	3.80	3.11	3.40	3.14

Note: Green: High relevance; Blue: medium relevance; Orange and gray: low relevance.
[a]Fuel refiner.
[b]Fuel wholesaler.
[c]Road construction sub-sector.

categories: Human rights, labour rights, heritage and communities, socio-economic impacts, and governance (Table 4). Given that some sub-categories might be more relevant than others, this aggregation included priority indexes provided by the stakeholders, who ranked each sub-category in its corresponding impact category, specifying the relevance to the activities closest to their operational scope. From these priority indexes, the SPIs were obtained for the system components and classified by impact categories. This aggregation delivers SPIs in continuous instead of discrete scores; therefore, ranges for new continuous valuation scales are established: very negative (1.00–1.79), negative (1.80–2.59), neutral (2.60–3.39), positive (3.40–4.19), and very positive (4.20–5.00).

Finally, a unique aggregated social performance index (ASPIs) was estimated for each case study, calculated as a single index from the weighted average of the SPI by impact category, calculated for each case study using the impact categories ranked by the stakeholders.

This approach takes into account aspects related to the materiality in the overall context of quantitative and qualitative information, and the importance denoted by the judgement of the practitioners (Eccles et al. 2012), provided a materiality analysis is considered an important part of sustainability and modern integrated reporting (Beske et al. 2020).

Although the S-LCA methodology provides a structured and participatory approach to social performance evaluation, it entails inherent limitations. For instance, the use of qualitative and semi-quantitative indicators may introduce interpretative subjectivity. Furthermore, the aggregation of social performance across categories may lead to compensatory distortions, where strong results in one area obscure weaker performance in another. To mitigate these risks, the analysis included stakeholder-defined weighting and disaggregated result interpretation.

3.2 | Case Study

The S-LCA methodology for organisational analyses requires the collection of primary data through stakeholder engagement, making the availability of local partners and access to companies critical for case study implementation (UNEP/SETAC 2009). Thus, the selection of case countries was driven by both analytical and practical considerations, including the need for representativeness, comparability, and logistical feasibility.

In this sense, our research group's first case study was for a company offering long-haul road transport in Spain, providing a baseline representation of social performance in a developed Western European country. Then, additional case studies were conducted in emerging economies to provide a contrasting perspective. Specifically, one in South America to understand the social performance of freight companies in a developing country within the Western hemisphere, and another in Southeast Asia to explore the combined influence of socio-economic development and cultural context in the Eastern hemisphere.

In Southeast Asia, the preliminary screening focused on English-speaking countries, including Singapore, the Philippines, and

Malaysia. Singapore and the Philippines were excluded due to their focus on short- and medium-distance freight transport, limiting comparability with the European case. Malaysia, an upper-middle-income country with a high Human Development Index (HDI) (UNDP 2018, 2024), was selected as it features longer-haul freight services.

A similar process was applied in South America. Candidates included large countries with significant medium- and long-distance road freight activity, such as Venezuela, Colombia, Perú, Argentina, and Chile. Brazil was excluded due to language barriers, while Argentina and Chile were not considered further due to their very high HDI, exceeding Malaysia's level. Among the remaining upper-middle-income candidates with high (but not very high) HDI, Colombia was selected based on both analytical suitability and pragmatic advantages, including strong collaboration with a local academic partner and secured access to a freight company and key stakeholders for data collection.

Beyond economic and institutional considerations, Spain, Colombia, and Malaysia share notable similarities in terms of ethnic diversity and climatic variation, making them compelling for comparative analysis. Malaysia is a multicultural nation comprising approximately 50% Malays, 22.6% Chinese, 11.8% indigenous Bumiputra groups, and 6.7% Indians (Noor 2024). Colombia is similarly diverse, with 10.6% of its population identifying as Afro-descendant, 3.4% as indigenous, and the remainder as mestizo (Bulanin et al. 2025). Spain, while predominantly European, exhibits significant regional cultural distinctions, including Basques, Catalans, and Galicians, each with unique languages and traditions (Heruela 2024).

Climatically, both Colombia and Malaysia experience a tropical climate with high humidity and consistent temperatures year-round, varying with altitude, ranging from hot lowlands to cooler highlands (Cruz Roja 2024; Whyte 2025a). Spain, although mostly Mediterranean, includes subtropical regions such as the Canary Islands (Whyte 2025b). These climates influence social vulnerability through exposure to floods, droughts, and heatwaves, which affect public health, food security, and livelihoods, particularly among marginalised populations (Carrillo et al. 2022; Li et al. 2023; Roncancio et al. 2020).

These shared characteristics of ethnic diversity and climatic variation provide a rich context for examining how different societies perceive and report on the social impacts of environmental issues within the freight transport sector.

In this context, road freight transport companies located in Pereira (Colombia), Zaragoza (Spain), and Kuala Lumpur (Malaysia) were selected. The system's boundaries were limited to the analysis of the direct suppliers: truck manufacturer, fuel distributor, producer, and road construction companies.

The evaluated system functions were:

- For the Colombian company located in Pereira, the unitary road freight service in a Chevrolet diesel truck from Pereira to Quibdó, refuelled at the Terpel Pereira station;
- For the Spanish company located in Zaragoza, the unitary road freight service in a Scania diesel truck from Zaragoza to Almusàfes, refuelled at its own service station;
- For the Malaysian company located in the Kuala Lumpur metropolitan area, the unitary freight service in a Nissan diesel truck from Kuala Lumpur to its main customer in the city of Kulim, refuelled at the Petron South City service station.

Since the system functions are the main services in the organisations' portfolios, the reference units in these cases were the reporting organisations. From the definition of the functions of the system, the value chain in each of the transport systems components, their geographical locations, and the involved stakeholders were identified.

In the Colombian case study, the truck manufacturer was GM Colmotores. The fuel wholesaler and producer were Terpel S.A. and Ecopetrol, respectively. The Pereira–Quibdó road was constructed by different companies in sections at different times. In the Spanish case study, the truck manufacturer was Scania, and the fuel wholesaler and producer was Repsol S.A. As in the Colombian case, the Zaragoza–Almusàfes road was constructed by different companies or consortia. Therefore, the analysis of road construction in these case studies was performed for the whole sub-sector by generic indicators. Regarding the Malaysian case, the truck manufacturer was Nissan Diesel Motor Co in Japan, currently named UD Trucks Corp., and the fuel wholesaler and producer was Petron Malaysia. The Kuala Lumpur–Kulim road was built by Projek Lebuhraya Utara–Selatan Berhad (PLUS).

4 | Main Results & Discussion

4.1 | Social Impact Per Sub-Category

Since the Colombian and Spanish case studies included several companies for road construction, a sectoral analysis considering one indicator by social impact sub-category was performed. To answer the first research objective of this study (RQ1), the information sources were mostly based on international reports and rankings, and normalised after the five-level colour scale (Table 4).

These sub-category results are weighted and classified into more general impact categories, after the relative importance given by the stakeholders (Table 5), considering a 40% relative weight given by interviewees for the results of the transport company and 20% for each of the analysed companies. The SPIs' aggregated results are shown in Figure 2.

The aggregated results showed that in all three cases, the best potential impacts were related to socio-economic repercussions. In the Colombian case, the SPIs were lower than in the other cases in most of the social impact categories. The obtained ASPIs were 3.22, 3.50, and 3.63 for the cases in Colombia, Malaysia, and Spain, respectively. These indices could suggest that the transport service life cycle is better in Spain than in Colombia. However, the S-LCA results should not be directly

TABLE 5 | Priority indexes by impact categories for the case studies in Colombia (a), Spain (b) and Malaysia (c). Based on (Osorio-Tejada et al. 2024).

Social impact categories	Priority indexes of categories			Social impact sub-category	Priority indexes of sub-categories		
	(a)	(b)	(c)		(a)	(b)	(c)
Human rights	0.22	0.19	0.26	Child labour	0.42	0.28	0.40
				Forced labour	0.30	0.37	0.31
				Equal opportunities/discrimination	0.27	0.35	0.29
Workers' rights	0.30	0.27	0.27	Freedom of association	0.15	0.13	0.14
				Fair salary	0.26	0.25	0.24
				Fair work hours	0.19	0.21	0.22
				Health and safety at work	0.21	0.23	0.24
				Social benefits/social security	0.19	0.18	0.16
Heritage and communities	0.13	0.15	0.12	Delocalisation and migration	0.11	0.11	0.08
				Respect for local traditions	0.08	0.09	0.13
				Respect for indigenous rights	0.14	0.07	0.13
				Community involvement	0.14	0.14	0.15
				Healthy and safe living conditions	0.17	0.20	0.17
				Access to material resources	0.12	0.13	0.12
				Access to intangible resources	0.10	0.11	0.08
				Transparency in social issues	0.14	0.14	0.14
Socio-economic repercussions	0.17	0.21	0.16	Creation of local employment	0.23	0.23	0.18
				Contribution to economy	0.20	0.16	0.19
				Prevention of armed conflicts	0.12	0.12	0.10
				Technological development	0.13	0.16	0.15
				Suppliers' relationships	0.13	0.15	0.14
				Confidentiality with customer info	0.10	0.10	0.13
				Feedback mechanisms	0.08	0.09	0.11
Governance	0.18	0.18	0.19	Commitment on sustainability	0.30	0.37	0.25
				Corruption	0.39	0.30	0.40
				Unfair competition	0.30	0.33	0.35

compared between case studies because they were affected by the stakeholders' perceptions, which vary due to social and cultural differences.

Furthermore, a disaggregated analysis for each case would allow for identifying the supply chain hotspots and where the strategies must focus to improve the social performance according to the stakeholders' expectations. In this sense, the results in Table 3 could help companies identify which different aspects of sustainability reports can be highlighted according to the social development context. For example, while in Colombian and Malaysian case studies, child labour was the most important aspect in the human rights category, in Spain, it was the least important, since it is not a concerning issue in the country, as happens with the respect for indigenous rights sub-category in the category of heritage and communities. Results could also be useful in comparing the sustainability reports inventories in an international context, that is, to benchmark the company's and suppliers' social performance internationally.

Therefore, as proven by the results, S-LCA studies can not only support companies in developing or complementing their sustainability reports, but also in defining efficient strategies to manage their supply chain after the priorities of each context. The critical points and stakeholders' concerns in all three cases were focused on workers' and human rights. The materiality in the Colombian case analysis was related to freedom of association, fair work hours, and health and safety at work. Since there is only one refiner in Colombia and changing the direct suppliers of diesel would not generate significant improvements, the

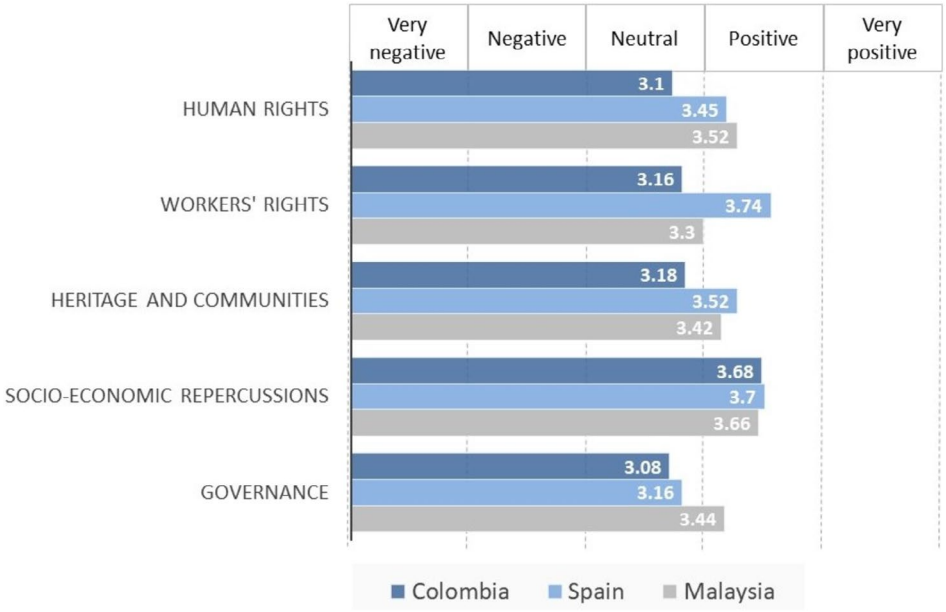

FIGURE 2 | SPIs of the system by impact category. [Colour figure can be viewed at wileyonlinelibrary.com]

remaining option would be to use a different type of fuel. As for trucks, since they are relatively new, no effect would be significant on changes in vehicle suppliers.

For the Spanish case, the stakeholders' perception of freight companies in the region was similar to that found for the evaluated transport company, with the exception of the fair working hours' sub-category, where stakeholders perceived that the drivers had extensive and irregular working hours, even though in the company analysed, the schedules were pretty regulated. The transport company could consider a change to introduce primary energy sources other than fossil oil, maintaining the same supplier as much as possible. For the acquisition of alternative fuel vehicles, although the evaluated manufacturer had a positive SPI, this index could be improved; thus, evaluating other potential truck suppliers is advisable.

For the assessed case in Malaysia, the fair salary was the most important aspect for workers, while the safety and health at work component was mainly ignored by employers and stakeholders, even where the infrastructure component had high accident rates. Many truck drivers were not concerned about their safety, mostly driving without safety belts. As for equality and diversity, gender was considered less relevant than race or religion. The use of alternative fuels by the transport company was non-viable as of now, due to the insufficient policies promoting sustainable transport and the limited market; however, the company could improve its SPI by purchasing new, more efficient diesel vehicles, in line with the social indicators proposed by Afshari et al. (2022) and Wyrwa et al. (2023) for the energy sector, assuming a higher degree of development for their application to the transport of goods.

4.2 | Implications for CSR/Sustainability Reports and GRI Standards

The CSR/sustainability reports in the transport sector typically include the environmental impact of company activities, mostly in the form of the organisation's carbon footprint. Although the reports tend to include the social dimension, the latter does not include the impacts derived from an integral analysis of the operation from an S-LCA perspective. This gap highlights the need for stronger frameworks that integrate social, environmental, and economic dimensions in a meaningful way (RQ2).

Integrity management plays a critical role in enhancing the credibility and effectiveness of sustainability reporting and CSR practices. As Borgonovi and Esposito (2017) emphasise, adopting integrity-focused policies helps organisations transition from compliance-driven frameworks to approaches that prioritise public accountability and transparency. This shift is essential to address gaps in current CSR and sustainability reports, particularly in sectors with significant environmental and social impacts.

Looking at the research findings, among the companies studied, most of those reporting on sustainability did report on environmental matters and, to a much lower extent, on social matters. However, none of them included social disclosure related to their environmental activity. In some cases, GRI indicators were used, but again, in close and unrelated compartments for environmental and social aspects. Specifically, GRI standards indicators from series 300 (environmental topics) and 400 (social topics) were reported by some companies (around a third of them), but they failed to link the specific activities to the derived social impact, the social consequences of environmental impacts, and the social implications according to the context. Given the insufficient information and indicators reported by companies and the little relevance given to the social dimension, comparing the S-LCA approach and the current GRI position is not easy. However, in order to compare the set of social indicators proposed after the S-LCA with the existing GRI indicators, we selected the company presenting a more exhaustive and detailed report among the different companies studied in the sector. The chosen company, which operates in the hydrocarbon and fuel industry—thus subject to important and various environmental impacts—reported under the framework of GRI

standards, including all 8 indicators for environmental impact and all 19 indicators for social impact. It has to be noted that responsibility for sustainability issues was not explicitly assigned to the board of directors for sustainability in line with Eccles et al. (2012).

Despite the volume and detail of information provided, the social impacts outside the company were only linked to economic and cultural matters, and no interconnection was reported between environmental impacts and effects on local communities, suppliers, and society as a whole. Indeed, the environmental impacts described in GRI 301 to 308 indicators have no translation into social impacts. On the other hand, even though the company claims it has undergone participatory processes with stakeholders, no reference was reported about the relevance given by stakeholders to the environmental impacts or to the most important social impacts derived from the company's activities.

In response to the second research question (RQ2), the S-LCA performed in this study shows not only many more social indicators, but also the relevance given by stakeholders and, thus, the reporting materiality. Since the company has complied with GRI standards by measuring and reporting all environmental and social indicators, it should not be blamed for the absence of relevant and significant information for stakeholders. Instead, it is the current GRI approach that is possibly lacking the appropriate format to allow and promote more comprehensive and interconnected information. In particular, a multi-stakeholder interaction, as suggested by Sharma and Sathish (2022), would assure a transparent monitoring mechanism. These case studies confirm the relevance of communication on CSR and sustainability to generate best practices for increasing stakeholders' expectations, as stated by Torelli (2023).

In all three case studies, the standard framework to report on social aspects is based on GRI sustainability reporting standards, which aim to support companies in integrating and implementing CSR policies. Some social measurements that are considered in these case studies are in line with the proposal of Papoutsi and Sodhi (2020) about employment, training, commitment, and communities. Although CSR alignment was stated in the three case studies, they did not focus on guiding the company's measurement of social performance, nor on assessing its impact on the product life cycle. The existing CSR indicators were complemented with more specific indicators developed in the framework of our S-LCA. Thus, it can be argued that S-LCA methodology is not intended to replace the GRI approach on data collection at the managerial level but rather to expand it and direct it towards inter-dimensional material issues, considering process-level data in the value chain of the product, service, or organisation.

Therefore, the current GRI standards, which provide less comparable, qualitative, and segmented information, could be significantly improved regarding the usefulness and value of the information transmitted by incorporating the proposed S-LCA methodology, advancing in the measurement and communication of sustainability.

However, despite the considerable advances made to report on environmental impacts by using the life cycle tools, as far as social aspects are concerned, there is still a much greater development pending (RQ3). Almost two decades ago, Moneva et al. (2006) pointed out the social indicators' weak sustainability. Indeed, it can be considered that the social dimension of reporting is still a critical and complex task for sustainability performance, which is in line with Hourneaux et al. (2018). Our findings enable the identification of potential areas where social aspects can be improved concerning accessibility and the adoption of standards to generalise performance indicators and thus transparency (Knebel and Seele 2015). In the face of the coming challenges concerning GRI standards and harmonisation, a newer vision for measuring and reporting social impacts from environmental issues, including S-LCA indicators, would help encompass the actual need for information from stakeholders using standardised frameworks such as GRI.

4.3 | Brief Insights and Discussion

This research aims to expand and highlight the knowledge on measuring and reporting social impacts linked to environmental issues, contributing to the discussion about the need for multifaceted indicators in sustainability reporting standards such as the GRI.

Particularly, social indicators should reflect the impact of environmental issues, assuming both dimensions are intertwined and that multifaceted indicators are necessary. The current reporting standards are not promoting or facilitating this important information.

The outcomes reflect that the S-LCA tool is an efficient approach to address multifaceted information, and that current reporting standards produce indicators that fail to involve different dimensions and prioritise the most relevant social impacts. Even though we agree with Afshari et al. (2022) in the lack of consensus for sustainability social indicators, the approach proposed in this research proves that such a consensus could be reached by using the S-LCA tools, establishing a wide range of social indicators from which every company would choose those more relevant to its stakeholders.

On the other hand, the geographical scope of the research shows that the same environmental issue is perceived by stakeholders in different ways, pointing out different social indicators to report. Where Wyrwa et al. (2023) call to reduce the disproportion among EU countries regarding sustainability and social development, our results suggest designing specific sets of multifaceted indicators that suit each country's reality, needs, and wills. These initiatives could mitigate the generalised poor quality of reports (Raimo et al. 2023) to foment an adequate level of transparency and meet the stakeholders' demand.

The new EU CSRD and ESRS standards could therefore consolidate the growth of the social pillar of TBL and its intersection with environmental aspects. In this scenario, this study infers a comparative analysis of three culturally distinct countries, given the interest they may represent for companies operating in cultures that value competitiveness and assertiveness as a means of maintaining legitimacy and public trust (Esposito et al. 2025). In addition, multifaceted indicators would help disclose issues that

are not highly regulated and are generally underrepresented in reporting (Searcy et al. 2016).

Nevertheless, it is worth reflecting on the absence of previous practices and shared expectations about social reporting, which could mean that the new regulation could not have the strength to enforce the regulation, as argued by Luque-Vílchez and Larrinaga (2016) for the adoption of CSR/sustainability Reporting practices, for example, in Spain (Correa-Ruiz and Moneva-Abadía 2011).

Looking at the other two countries that have studied and observed the CSR practices in developing economies, such as Colombia and Malaysia, our outcomes suggest that CSR and sustainability reporting may be perceived differently. In both countries, compared to Spain, the fair salaries, creation of local employment, and opportunities are far more relevant, possibly due to the level of development of their economies and economic growth (Chabán et al. 2024; Sharma and Sathish 2022). Indeed, in all three countries, the socio-economic repercussions are notable. However, while in Spain the latter are mostly linked to workers' rights and health, Colombian and Malaysian stakeholders appear to be more interested in Freedom of Association or Human Rights. It is in this respect that the geographical focus shows how companies reporting about environmental concerns may be influenced or biased by the stakeholders' perception, and how the socio-economic and cultural context determines this perception. Indeed, the three contexts suggest different priorities which, in a way, depict their society's culture and understanding of sustainability. Where freedom of association, social benefits, and child labour are relevant matters for Colombians, for instance, Malaysians seem more interested in health and safety at work, respect for local traditions, or governance.

In line with the goals of the Integrated Reporting or the European Sustainability Reporting Standards, the use of S-LCA contributes to the disclosure of non-financial information closely related to key intangible elements of value generation at the public and organisational level, especially in emerging economies (Ficco and Luna Valenzuela 2021). Besides, it is clearly a promising solution to overcome the limitations of the traditional financial reporting standards (Busco et al. 2019).

Considering the implications for practitioners and scholars, it becomes clear that comparing the three countries' behaviour and trends linked to sustainability perception and reporting is hard, since many different aspects influence their population and business culture. Besides material factors as those previously mentioned, other relevant variables should be taken into account such as the religious influence (Christian/Muslim), the type and importance of business relationships and culture, as studied by Hofstede (1984), for instance, or the historical evolution of economic models (Western vs. Oriental), as argued by Freedom House (2017), among others.

Recent studies, such as (Faúndez-Ugalde et al. 2022), point to a lack of homogeneity in the way Latin-American companies report on sustainability and transparency, and in the way they address stakeholders. The public or international nature of the company determines the quantity and quality of the reporting (Sánchez-Hernández et al. 2021), but the requirements of international institutions do not always satisfy the needs of local society (González Ortiz et al. 2020). In this respect, the outcomes obtained in this research using S-LCA indicators for Colombian companies could be applicable to many other countries in the region with similar economies, such as Perú, Chile, Brazil, or Bolivia, among others.

As stated by Tran et al. (2021), the level of sustainability reporting in Southeast Asia greatly varies among countries, depending mostly on the internal governance structure. Indeed, the regulatory approach to governance and reporting is different in countries like the Philippines and Indonesia than in others like Malaysia or Thailand. However, the transversality and large scope of the S-LCA, in contrast to other standards such as the GRI, allow for a tailor-made focus on the information and indicators to be reported, in line with the country and stakeholders' particular interests. The results obtained for Malaysia within this research show a different approach to sustainability than in Colombia or Spain, in areas such as labour conditions, freedom of association, or safety at work. However, as proved by Tran et al. (2021), the approach to social concerns is pretty similar in most Southeast Asian countries, with the exception of the Philippines and Vietnam, where major factors such as religion and economic model, respectively, influence the general approach of companies. Therefore, our results may contribute to understanding the potential for extensive and useful reporting of the S-LCA in many Southeast Asian companies.

From the policymakers' point of view, our outcomes make it clear that a different approach is needed for every case so that the stakeholders can access the relevant information (to them) on the social impact of environmental issues. Our results suggest that other territories or countries would also show similar differences in sustainability reporting perception and relevance to social issues. It makes sense to question whether countries like Colombia in South America and Malaysia in Southeast Asia would present equal trends or drivers explained by cultural common contexts. However, most CSR reporting research and normative development to date targets highly developed economies and only rarely places the spotlight on emerging markets, despite the impact that CSR may increasingly have on the economic activities of these markets (Chabán et al. 2024).

In this regard, the surge of new norms, regulations, and common practices for sustainability reporting in Western countries is seen as both a challenge and an opportunity by many emerging economies, which struggle to adopt the international requirements while adapting to their local needs (Tauringana 2021). However, there are signs that suggest that developing nations are providing more information on sustainability practices as compared to the companies in the developed nations (Bhatia and Tuli 2018). Adopting less ethnocentric schemes, open to local particularities and culture, envisaging environmental-social impacts, and based on multifaceted indicators, such as the S-LCA, could therefore be a step forward towards sustainability disclosure and stakeholders' engagement. Thus, the multifaceted approach adopted in this study allows for the assessment of complex measurement from multiple perspectives. They go beyond single metrics by incorporating approaches in different countries and dimensions.

5 | Conclusions

In times of significant efforts to regulate non-financial information reporting by companies, this study addresses the pending challenges for sustainability reporting, particularly in expanding the range of multifaceted social impact indicators. Taking as a research case a sector with high environmental impact, such as freight transport, three different geographical scenarios were studied, defined by diverse socio-cultural and economic conditions, which serve as representative examples of their respective continents, thus bringing in the particular vision of relevant social indicators. A wide range of indicators for social impacts measurement was analysed through the application of the S-LCA from a perspective that has not been empirically approached before, establishing direct communication with many stakeholders. This approach contributed to generating fruitful communication with freight transporters and customers to define the most relevant impacts from their perspective, as well as the most sustainable practices in terms of social impacts related to environmental performance.

From a theoretical perspective, the results suggest that sustainability reports (and GRI standards) are drifting towards legitimacy motivations rather than normative ones. Companies fulfil the continuously growing number of indicators demanded by both society and institutions, which are more and more specific, but still fail to include socially relevant information, especially when a multifaceted focus is needed. The fact that most companies undergo the same type, format, and style of sustainability reporting, *blindly* guided by standards such as GRI, suggests coercive or mimetic isomorphisms rather than a true focus on their stakeholders and their actual demands and needs.

With this research, the contribution to the literature is two-fold. On the one hand, it helps extend the use of S-LCA to assess the impact of economic activities on the social context, bringing in systematic and quantitative indicators that allow for more accurate and useful information. These indicators and methodology could be used to extend and adapt the current sustainability indicators, particularly the frequently neglected social and multifaceted indicators. On the other hand, it exposes a consistent assessment of the freight transport sector in terms of its social impact by studying relevant case studies in detail. Both contributions are relevant and useful to scholars and practitioners willing to advance in the study of social accounting and reporting. The results of this study prompt several recommendations for management practice related to the perceptions of indicators when addressing the interests of various stakeholders in different countries.

Furthermore, the novel approach adopted in this study to clarify the debate about the need for multifaceted social indicators in sustainable development and business reporting framework may help policymakers and government authorities reframe or adjust the regulation for transparent monitoring mechanisms in a multi-stakeholder environment. Specifically, from the freight transport sector perspective, the results of this research offer an explicit approach to improve policies supporting the adoption of sustainable practices in different regions and, most especially, in emerging economies where priorities may be rather different from those in Western countries. Furthermore, practitioners and companies within the sector may use our outcomes to adapt and improve their metrics for social indicators and sustainability reporting policies, shifting from complying and benchmarking to truly addressing their own stakeholders' needs and priorities.

Finally, it is important to acknowledge a persistent methodological limitation that may affect the generalisability of S-LCA results. The absence of harmonised criteria for selecting, weighting, and aggregating indicators limits the comparability of outcomes across case studies. While this flexibility enables adaptation to local conditions and stakeholder input, it constrains benchmarking and synthesis efforts. Thus, practitioners could apply S-LCA to add specific social metrics, enhancing actual standards. Future studies could address this by promoting greater methodological standardisation to enhance consistency and transparency in S-LCA applications.

In addition, like all empirical research, this study is subject to certain limitations. The analysis of social indicators involves challenges such as limited data availability, subjective interpretations, and the need to define clear system boundaries. To address these, the study incorporated detailed methodological protocols, particularly for the design of metrics and stakeholder engagement. Additionally, analysing case studies across three culturally and economically diverse countries required a degree of interpretive generalisation that cannot fully reflect every sector-specific or regional complexity. While the findings from Spain, Colombia, and Malaysia are not statistically representative, they offer illustrative insights into how contextual variables influence organisational practices and stakeholder perceptions of social impacts. These examples serve as a valuable foundation for future research, especially in similarly emerging or transitional economies, and highlight the need to explore cultural, institutional, and cross-sectoral dynamics when developing and applying multifaceted social indicators. Although increased standardisation would enhance S-LCA transparency, this study overcame limitations through an applicable comparative analysis. In future studies, the application of analysis methodologies such as propensity score matching (PSM) could help reduce confounding biases related to the qualitative analysis of the multiple data provided by the three case studies.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Peer Review

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/beer.70020.

Endnotes

[1] These analyses were based on secondary sources such as CSR and sustainability reports of each company and complemented and contrasted with data from third-party reports from newspapers, non-governmental organisations or specific institutions (Amnesty International 2017; Anker et al. 2003; Cornell University et al. 2017; Freedom House 2017; HIIK 2017; Hsu et al. 2017; ILO 2017; KPMG 2017; Pew Research Center 2017; Transparency International 2017; UNICEF 2017; USDOL 2016; WEF 2016, 2017; WHO 2016).

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