

# Exploring sector-specific sustainability indicators: a content analysis of sustainability reports in the logistics sector

Logistics  
sector

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## Abstract

**Purpose** – Businesses produce corporate sustainability information in support of the decision-making of their stakeholders through sustainability reporting. However, the use of such information has been limited because of the broadness of sustainability indicators used in sustainability reports. This study aims to identify sector-specific sustainability indicators and priorities based on the material issues of the logistics sector.

**Design/methodology/approach** – The authors conducted an exploratory study using 64 sustainability reports from the logistics sector. Qualitative content analysis was performed using Leximancer software to identify key themes and material concepts of sustainability reports.

**Findings** – The results showed that the most important indicators of the logistics sector are economic performance and energy, yet sustainability reports appear to focus more on reporting social sustainability information. Of the several sustainability measures, environmental and social factors dominated the reporting (8 economic, 62 environmental and 58 social). This discrepancy can also imply inconsistencies in sustainability reporting.

**Practical implications** – Identifying sector-specific indicators enables assessing the impact of sustainability issues on value creation and performance comparison among similar organizations. This is also beneficial in ensuring consistency of sustainability reporting, which is a prerequisite for policymaking in sustainable logistics.

**Originality/value** – Prior studies emphasized that no sector-specific sustainability indicators were established in the literature and standardized indicators are needed to ensure the comparability of results. This study addresses this gap by identifying sector-specific sustainability indicators based on the material issues of the logistics sector.

**Keywords** Content analysis, Sustainability indicators, Leximancer, Corporate sustainability, Sustainability reporting, Logistics sector

**Paper type** Research paper

## 1. Introduction

The broad view of sustainability reporting limits the identification of the most important sustainability issues – material sustainability issues – in terms of their impact on value



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creation. Identification of material sustainability issues are context-dependent and the materiality of sustainability issues must be identified on a sector-specific basis (Eccles *et al.*, 2012). The Global Reporting Initiative (GRI) (an internationally recognized standards organization) defines materiality as “a topic that reflects a reporting organization’s significant economic, environmental and social impacts or that substantively influences the assessments and decisions of stakeholders” (GRI Standard, 2016, p. 12). Studies on the logistics sector do not adequately focus on material sustainability issues; instead, they look at different sustainability aspects such as investigating the association between green logistics performance and sustainability reporting (Karaman *et al.*, 2020), examining internal and external practices related to environmental sustainability (Massaroni *et al.*, 2016), analyzing factors influencing the level and scope of reporting (Piecnyk and Björklund, 2015) and studying the implementation of environmental initiatives (Colicchia *et al.*, 2013). Lambrechts *et al.* (2019) attempted to provide evidence of sustainability reporting on economic, environmental and social indicators. The authors noted that the logistics sector did not exhibit compatible patterns of what they value as material sustainability indicators. Studies emphasized that no sector-specific sustainability indicators were established in the literature and standardized indicators are needed to ensure the comparability of results (Piecnyk and Björklund, 2015). Our study addresses this gap by exploring sector-specific sustainability guidelines that can enable researchers and managers to identify the impact of sustainability issues on value creation and compare performance with similar sector organizations.

Corporate or business sustainability is defined as “the ability to conduct business with a long-term goal of maintaining the well-being of the economy, environment and society” (Hassini *et al.*, 2012, p. 70). Existing literature has contradicting views on sustainability practices and their reporting along these three dimensions. Most studies focus on balancing the three dimensions of sustainability while adopting sustainable logistics practices (Papoutsi and Sodhi, 2020; Aldakhil *et al.*, 2018). Batista *et al.* (2020) argued that environmental and economic dimensions are more important than the social dimension because of the high impact of economic and environmental factors on sustainability. Meanwhile, Markman and Krause (2016) indicated that sustainable practices must be prioritized in the following order: environment, society and economics. On sustainability reporting, Székely and Knirsch (2005) observed an increasing trend of reporting economic, rather than environmental and social, sustainability. The authors describe reporting on these dimensions is unequally covered and that these dimensions must be balanced in reporting. In contrast, Székely and Vom Brocke (2017) observed that all three dimensions were equally emphasized. Lambrechts *et al.* (2019) found that social indicators are more widely used than economic and environmental indicators. These contradictory views motivate us to further examine how logistics sector organizations report their sustainability initiatives under these three dimensions and which dimensions are more material for this sector. This investigation is important because sustainability practices vary across sectors (Lambrechts *et al.*, 2019; Székely and Knirsch, 2005).

Various theories are applied to the relationship between corporate sustainability reporting and sustainability dimensions. Parker *et al.* (2015) used stakeholder theory to explore a firm’s relationship with stakeholders when communicating corporate social responsibility. Ching and Gerab (2017) grounded the stakeholder theory, legitimacy and signaling theories to their study and found that disclosure for economic and social dimensions is better than environmental dimension to enhance the organizational legitimacy with social and economic audiences. Karaman *et al.* (2020) used signaling theory to validate the hypothesis of higher green logistics performance is more likely to be associated with sustainability reporting. Systems theory and complexity theory were relatively less used in

the literature, but they are relevant to exploring corporate sustainability. [Barile et al. \(2014\)](#) used systems theory in exploring sustainable business behavior and argued that systems theory concerns the possibility of value created by sustainability practices from an enlarged view. [Mitleton-Kelly \(2011\)](#) used complexity theory to demonstrate that the organization is a complex social system so, sustainability problems cannot be addressed only by a single dimension. In this study, we address our research questions through these various theoretical lenses using sustainability reports from the logistics sector.

We conduct an exploratory study to identify the sector-specific sustainability indicators and priorities based on the material issues of this sector. The main research questions are: (RQ1) What are the most widely used sustainability indicators for the logistics sector? (RQ2) To what extent are sustainability dimensions (economic, environmental and social) represented in the sustainability reports? (RQ3) Which sustainability dimension is more material for the logistics sector? Findings for these questions will help decision-makers to prioritize their sustainability initiatives based on the impact of sustainability issues.

The remainder of this study is organized as follows. In Section 2, we undertake the literature review. In Section 3, the research methodology is outlined. Section 4 presents the results and discussion. In Section 5, the conclusion is presented.

## 2. Literature review

### 2.1 Sustainability

Brundtland report's definition for sustainability development ("the development that meets the needs of today without compromising the ability of future generations to meet their needs") has been widely used ([WCED, 1987](#)) instead of sustainability. Historically, the concept of sustainability mainly focused on a broad view of environmental protection. With the introduction of the Brundtland Report for sustainability development, the focus has shifted to the three pillars of sustainability: economic, environmental and social. In more recent literature, sustainability is discussed from different aspects ([Marino and Pariso, 2020](#)), disciplines and sectors ([Ching and Gerab, 2017](#); [Stindt, 2017](#)) and commonly, corporate or business sustainability was focused ([Asif et al., 2011](#)). Corporate sustainability has evolved because of economic growth, environmental regulation and the influence of the social justice movement ([Christofi et al., 2012](#)).

### 2.2 Sustainable logistics

The logistics sector plays a vital role in the globalized business context and involves several activities such as material handling, purchasing management, packaging, freight transportation and border clearance ([Mariano et al., 2017](#)). As a highly energy-intensive service industry, the sector is responsible for significant energy usage and emissions ([Maas et al., 2014](#)). This ultimately creates severe sustainability issues locally and globally ([Yu et al., 2016](#)). Companies integrate sustainable concepts into logistics activities mainly because of the corresponding negative environmental impacts ([Oberhofer and Dieplinger, 2014](#)), customer pressure and government regulations ([Chu et al., 2019](#)). Companies also expect to increase sustainability performance by implementing sustainable practices because of the negative environmental impact of their business operations ([Agyabeng-Mensah et al., 2020](#)). However, most of the previous studies did not attempt to conduct a comprehensive analysis of the economic, environmental and social aspects of logistics systems ([Batista et al., 2020](#)). Lack of reporting guidelines limits such a comprehensive analysis especially in environmental and social aspects, which also impede the advancement in corporate sustainability ([Stindt, 2017](#)).

### *2.3 Corporate sustainability and sustainability reporting*

Piecyk and Björklund (2015) treated corporate social responsibility and business sustainability as synonyms. The authors viewed business sustainability as the commitment of corporations to sustainable development. Székely and Knirsch (2005, p. 628) defined corporate sustainability as “sustaining and expanding economic growth, shareholder value, prestige, corporate reputation, customer relationships and the quality of products and services.” Organizations often used the term “corporate sustainability” when they integrate social and environmental considerations into their business operations (Isaksson and Steimle, 2009).

Sustainability reporting is a management tool for corporate sustainability (Schaltegger *et al.*, 2006). Companies use sustainability reports to inform stakeholders and enhance their reputation, sometimes through “greenwashing” (Lyon and Maxwell, 2011). There is also the view that the logistics sector legitimizes its core operations through sustainability reporting, particularly when local and international stakeholders have competing interests (Karaman *et al.*, 2020). This voluntary disclosure of sustainability reporting practices appears to be constructive when responding to environmental issues (Walton *et al.*, 1998).

### *2.4 Theoretical considerations in corporate sustainability*

Various theories such as stakeholder theory, legitimacy theory, signaling theory, systems theory, complexity theory have contributed to corporate sustainability in the literature (Karaman *et al.*, 2020; Ching and Gerab, 2017; Parker *et al.*, 2015). Stakeholder theory suggests that companies’ activities affect not only shareholders but also other related parties such as employees and the local community, thus, they must be considered when making decisions (Freeman, 2004). Therefore, corporate sustainability should focus on stakeholders’ requirements (Asif *et al.*, 2011). Legitimacy theory posits that companies adopt sustainability reporting to legitimize their business in society. Accordingly, companies expect to convince society that they are not breaching norms and expectations by reporting sustainability (Faisal *et al.*, 2012). Many sustainability studies use legitimacy and stakeholder theories to explain voluntary sustainability disclosures (Miles and Ringham, 2019). According to signaling theory, sustainability reporting is used to give signals about the corporate sustainability performance to its stakeholders (Mahoney *et al.*, 2013). Systems theory considers the organization as a system, which focuses on structures, relationships and interdependent elements (Von Bertalanffy, 1968). It is important to look at the organization as a system to understand how it operates and sustains with its interrelated elements. The complexity theory considers a system as complex based on some characteristics such as nonlinearity and feedback (Sherif, 2006). Amagoh (2016) described that organization’s nonlinear behavior with the external environment is important for its survival. Corporate sustainability reporting can, therefore, be considered as a tool for exposing organizational interaction with the external environment to the stakeholders.

### *2.5 Global reporting initiative standard*

The GRI standard is an internationally recognized reporting framework, based on the three dimensions of sustainability, for organizations regardless of their size, sector and location. GRI is the most widely used sustainability reporting guideline because of its prominence among different industries worldwide (Medel-González *et al.*, 2013). The key reason for promoting this guideline is to provide uniformity and comparability in reporting across periods and firms (Kuzey and Uyar, 2017).

The GRI standard consists of three topic-specific standards: economic (GRI 200), environmental (GRI 300) and social (GRI 400). The use of topic-specific reporting standards

is subject to the materiality of the topic for an organization (GRI Standards Download Center, 2021). It is important to explore topic-specific standards in-depth to identify sector-specific sustainability dimensions. This is because the sustainability reporting practices of an organization vary according to the sector (Székely and Knirsch, 2005). The GRI standard for reporting organizations' material impact related to the three sustainability dimensions (economic, environmental and social) is presented in Table 1.

### 3. Research methodology

#### 3.1 Research design

We used content analysis on GRI reports addressing the research questions stipulated in earlier sections of this study. Content analysis is a research method used to draw valid inferences from text (Weber, 1990) and used to split many written documents into meaningful categories (Krippendorff, 2004). It is a useful technique for understanding the conceptual structure of certain documents to identify the most important themes and concepts within a text database related to a particular domain (Fisk et al., 2014). This includes categorizing and classifying the main themes through coding. Coding can be performed in three ways:

- (1) manual coding,
- (2) computer-assisted coding; and
- (3) computer-based coding using dedicated software such as Leximancer (Cretchley et al., 2010).

Content analysis can be performed both qualitatively and quantitatively. The analysis method depends on the aim of the study (Elo and Kyngäs, 2008). We used qualitative content analysis (Saber and Weber, 2019), both manually and machine learning using the

Economic	Environmental	Social
Economic performance	Material	Employment
Market presence	Energy	Labor/management relations
Indirect economic impacts	Water	Occupational, health and safety
Procurement practices	Biodiversity	Training and education
Anti-corruption	Emissions	Diversity and equal opportunity
Anti-competitive behavior	Effluents and waste	Non-discrimination
	Environmental compliance	Child labor
	Supplier environmental assessment	Freedom of association and collective bargaining
		Forced or compulsory labor
		Security practices
		Rights of indigenous people
		Human rights assessment
		Local communities
		Supplier social assessment
		Public policy
		Customer health and safety
		Marketing and labeling
		Customer privacy
		Socio-economic compliance

**Table 1.**  
GRI Standard for  
sustainability  
dimensions

Source: GRI standard

frequency and co-occurrence algorithms with the assistance of Leximancer (Kim and Kim, 2017).

Leximancer uses high-level natural language processing that quantifies texts based on Bayesian theory (Watson *et al.*, 2005). Leximancer aids in conceptual analysis through extracting frequently occurring terms (concepts) in documents and a relational analysis by tabulating the co-occurrence of concepts to identify inter-relationships among them (Leximancer User Guide, 2018). It has been a popular platform in recent literature because of its capabilities and ease of interpretation. Various studies have used Leximancer for content analysis due to its benefits (Ma *et al.*, 2018; Fisk *et al.*, 2014). Terblanche *et al.* (2008) state that it is easy to use and results are straightforward to interpret. Lemon and Hayes (2020) showed the use of Leximancer in enhancing the trustworthiness and credibility of qualitative research. The trustworthiness and credibility are ensured by Elo and Kyngäs (2008) and Graneheim and Lundman (2004).

### 3.2 Sample selection

We collected 64 publicly available sustainability reports using several criteria through the following four steps (Figure 1).

Step 1: We collected sustainability reports from the GRI sustainability disclosure database (GRI, 2016). Organizations belonging to the logistics sector were selected (criterion 1). A total of 1,327 reports from 325 organizations were found.

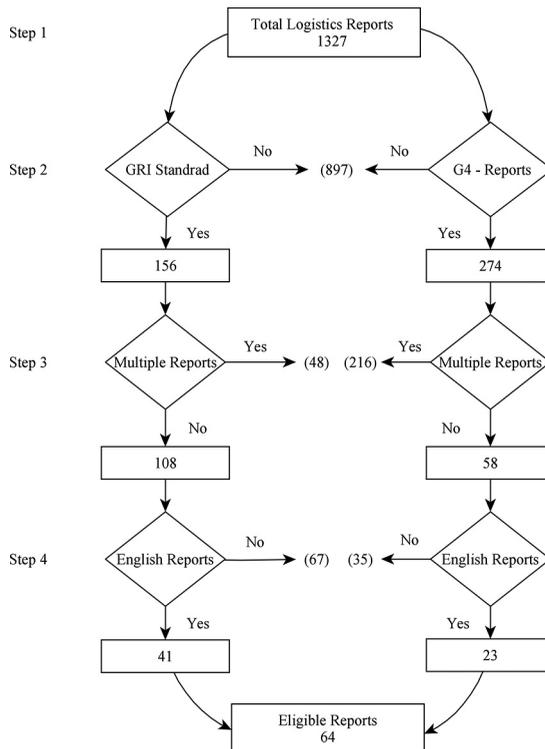


Figure 1.  
Sample selection  
process

Step 2: We used report types as “GRI standard” and “G4” for further screening (criterion 2) for the past five years. This resulted in 156 and 274 reports, respectively.

Step 3: We selected only the latest report from one organization (criterion 3) and removed reports from other years’ reports to avoid an overrepresentation of similar information. This screening resulted in 108 GRI standard reports and 58 G4 reports.

Step 4: We limited our sample to only the English language (criterion 4) and this step resulted in a final sample size of 41 GRI standard reports and 23 G4 reports.

### 3.3 Analysis method

Leximancer produces concept maps that show the relative co-occurrence of concepts that can be traced through the visualization of the concept maps. The collection of words in the text is referred to as concepts and visually emergent groups of concepts are referred to as themes. Themes are indicated in the colored circles; hot colors (red and orange) denote more important themes and cool colors (blue and green) denote less important themes. Concepts are indicated by dots within the themes and the size of the concept dots denotes their connectivity in the concept map. The reliability of the Leximancer analysis was assessed in two ways:

- (1) stability (the ways of classifying the texts and identifying relationships among concepts are always consistent) and
- (2) reproducibility (the same result is produced regardless of the number of times data are coded and recorded) (Fisk *et al.*, 2014).

We used Leximancer 4.5 to analyze and explore the qualitative data as follows:

*Classification of reports:* First, we classified all the reports into three folders according to the size of the company (large; 42 reports, multi-national (MNE); 19 reports, small and medium (SME); 3 reports).

*Text processing and concept seed generation:* We followed automatic text processing and assigned tags for the folders of large, MNE and SME to enable a subgroup analysis.

*Concept editing:* We defined concepts that should be in the concept map instead of using auto-generating concepts. User-defined concepts were based on the GRI standard and indicators were found in the academic literature.

*Concept coding:* “All concepts” and “all discovered names” were selected with subfolders for mapping concepts.

*Output:* The output of the Leximancer conceptual map can be presented in two ways: a social network (Gaussian) map or a topical network (linear) map. We decided to select the social network map as it emphasizes the similarity between the conceptual context in which the words appear and maximizes possible indirect relationships (Haynes *et al.*, 2019).

## 4. Results and discussion

### 4.1 Themes and concepts

Figure 2 shows a concept map with 32 concepts and 12 themes. The most important themes are economic performance and energy. The importance of a theme is determined not by its size but is based on the number of concepts present in the theme (Leximancer, 2021). Economic performance is more related to the concepts of market, anti-competitive behavior, waste, fuel and material. Energy is more related to concepts of fuel, emissions, water and material. The size of the theme is determined by the number of connections. For each theme, the connectivity and hits are calculated (Table 2). Hits refer to the number of texts associated with each concept. We analyzed the total number of themes, connectivity and hits to identify



values that sustainability reports bring to the company. Economic performance is also important to create a better workplace for employees, enhance the community's social well-being and make environmental investments. Thus, economic performance is linked to other social and environmental concepts.

Energy is significant as the logistics sector depends heavily on energy consumption (Rashidi and Cullinane, 2019). Dependence on fossil fuel as the major source of energy creates harmful emissions into the environment causing climate change and threatening human livelihoods. Stakeholders influence this sector to adopt sustainability initiatives to minimize the negative environmental impact of energy usage (Lai and Wong, 2012). The sustainability reports of logistics companies focus more on reporting energy-related information to inform stakeholders that their sustainability initiatives help reduce energy usage and greenhouse gas (GHG) emissions. These practices on the other hand improve social and economic performance.

#### 4.2 Concepts analysis

Economic performance was the most frequently reported economic indicator, while indirect economic impact and anti-corruption were not identified at all (Table 3). For the environmental dimension, environmental compliance, energy, emissions, material, water, biodiversity and waste were largely reported, but supplier environmental assessment was not recognized. In the social dimension, local communities, employment, health and safety, training and education were prominent indicators, whereas socioeconomic compliance, nondiscrimination and rights of indigenous people were least reported. These results indicate that logistic companies do not consider all GRI indicators as important.

We also identified how much weight was given to each sustainability dimension in sustainable reports based on the total counts of GRI categories (Table 4). Total count shows 20% of the content of the report includes economic disclosures, 36% consists of environmental information and 44% is related to the social dimension. These results may be due to an imbalance of sustainability indicators in the GRI framework. Studies show that topics on economic, environmental and social sustainability are equally distributed in sustainability reports (Székely and Vom Brocke, 2017; Roca and Searcy, 2012). Deegan and Gordon (1996) found that industries that have a high impact on the environment may disclose more information on social responsibility.

#### 4.3 Analysis of sustainability measures

We ran queries for the most relevant concepts identified under each dimension of sustainability to identify widely reported sustainability measures. We identified eight economic, 62 environmental and 58 social measures based on the query results (Appendix). A detailed indicator analysis revealed that companies report their sustainability performance in several ways and that there is no consistency in reporting indicators. This result compares well with the findings of Lambrechts *et al.* (2019) and Roca and Searcy (2012). The wide scope provided by GRI can lead to differences in sustainability indicators (Roca and Searcy, 2012). The diversity of indicators maybe because there is no mandatory requirement for sustainability reporting. These findings contradict Farooque and Ahulu (2017) and Eccles *et al.* (2012), who found compatible patterns of sustainability reporting in the same industry organizations.

#### 4.4 Analysis of company size

Large companies are closely connected with economic and social themes, whereas MNE is closely linked with environmental and local community themes (Figure 2). Although SMEs

EBR 34,3	Sustainability indicators	Text count	Relevance (%)
<b>330</b>	<i>Economic</i>		
	Economic performance	20,449	57
	Anti-competitive behavior	2,440	07
	Market presence	1,814	05
	Procurement practices	598	02
	Indirect economic impacts	–	–
	Anti-corruption	–	–
	<i>Environment</i>		
	Energy and fuel	9,677	27
	Environmental	8,868	25
	Environmental compliance	5,940	17
	Emissions	5,456	16
	Material	5,683	16
	Water	4,375	12
	Biodiversity	3,163	09
	Effluents and waste	2,170	06
	Supplier env. assessment	–	–
	<i>Social</i>		
	Social	18,395	53
	Local communities	7,964	23
	Employment	6,126	18
	Occupational, health and safety	6,028	17
	Training and education	5,428	16
	Customer health and safety	1,950	06
	Customer privacy	1,950	06
	Human rights assessment	1,337	04
	Public policy	1,130	03
	Security practices	1,019	03
	Labor/management relations	800	02
	Diversity and equal opportunity	775	02
	Supplier social assessment	654	02
	Forced or compulsory labor	422	01
	Freedom of association	402	01
Child labor	344	01	
Marketing and labeling	343	01	
Socio economic compliance	145	00	
Non-discrimination	117	00	
Rights of indigenous people	–	–	

**Table 3.**  
List of GRI standard  
concepts counts

**Source:** Leximancer output

	GRI category	Total text count	(%)
<b>Table 4.</b> Summary of total concepts counts for GRI categories	Economic	25,301	20
	Environment	45,332	36
	Social	55,329	44
	Total	125,962	100

are also closely connected with an environmental theme, this finding may not hold as the sample size is small. We used the prominence index (PI) to compare the concepts for each category (large and MNE). PI considers the different quantities of text contained in each report and is an absolute measure of the correlation between concepts and categories (Young *et al.*, 2015). If PI is less than one, the concept and category have a negative correlation; if PI is greater than one, it has a positive correlation; if PI is equal to one, there is no correlation. Values greater than two indicate notable prominence (Young *et al.*, 2015; Kim and Kim, 2017).

Large organizations considered social indicators such as employees, local communities, health and safety, training and education and economic performance as more important, whereas MNEs focused more on environmental indicators such as emissions, energy and material than economic and social indicators (Table 5). Disclosing more economic information may be due to mandatory financial reporting requirements (Farooque and Ahlu, 2017). Social information related to employees, local communities and health and safety may be reported for building a good corporate image. This is an indication for reporting the boundary of reputation management (Miles and Ringham, 2019). MNEs may report more environmental information as they must comply with more environmental rules, regulations and standards when they conduct their business in different countries. In contrast, the environmental impact of MNEs is probably higher than large companies' business operations due to the former's high use of energy and resources. Companies with a high environmental footprint are more likely to disclose sustainability information (Haufler, 2010; Mirza and Zimmer, 2001). The organizational boundary influences the differences in reporting sustainability information due to cost considerations of data collection (Miles and Ringham, 2019).

#### 4.5 Analysis of material topics

One of the main principles in the GRI standard is to identify the most important topics regarding organizational activities in terms of sustainability. According to the GRI standard, the material issues of an organization are the activities that cause significant economic, environmental or social impacts. Stakeholders consider these activities as important because material issues affect their decisions related to the reporting organization. Companies usually execute materiality analysis by ranking each topic in a matrix and presenting it in sustainability reports. This shows the reporting

Large Concept	PI	MNE Concept	PI
Employees	3.1	Emissions	4.3
Economic	3.0	Environmental	3.8
Economic performance	3.0	Energy	3.6
Compliance	3.0	Material	3.4
Local communities	3.0	Social	3.2
Health and safety	3.0	Health and safety	3.1
Social	2.9	Compliance	3.1
Training and education	2.8	Economic performance	3.1
Material	2.8	Economic	3.0
Environmental	2.7	Local communities	3.0

Source: Leximancer output

**Table 5.**  
Ranked concepts for  
large and MNE  
companies

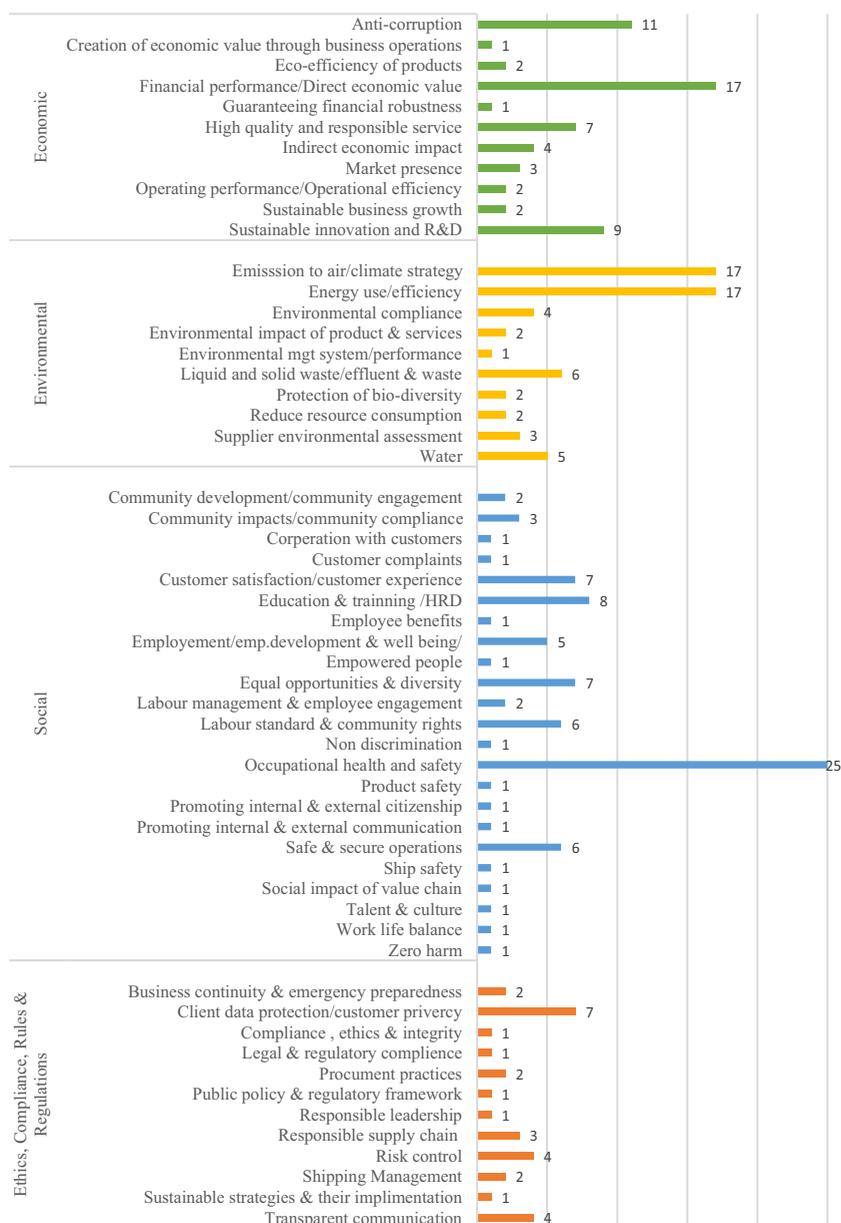
boundary of stakeholder engagement (Miles and Ringham, 2019). Most companies use online surveys and approach internal and external stakeholders through email to identify material issues. In our sample of 64 reports, only 40 reported the materiality matrix ranking their material issues based on their importance. Though the GRI standard-setters show the materiality analysis enhances the quality of information disclosure, reporting about materiality assessment remains voluntary to date (Beske *et al.*, 2019).

We analyzed all the materiality matrices and identified the most material topics for the logistics sector in terms of sustainability. Figure 3 presents a summary of the material topics. Many logistics companies identified occupational health and safety as a highly important topic. This may be due to the risk of serious occupational accidents according to the nature of the sector (Piecyk and Björklund, 2015). This topic represents the social dimension of sustainability. Social sustainability in the supply chain is narrowly identified through the safety and welfare of employees and employees' health and safety directly affect the firm's sustainability (Mani *et al.*, 2015). From an economic perspective, financial performance and direct economic value were considered the most material topics. Regardless of the sector, the key goal of every organization is to increase the value of shareholders. Financial performance or economic value is important to achieve these goals. Energy and emissions were considered critical environmental issues. This is obvious because the logistics sector heavily influences environmental issues, as transportation is a major source of GHG emissions (Karaman *et al.*, 2020). Additionally, logistics companies consider customer privacy as a material topic among ethical and compliance issues. Overall, more material issues were identified from the social dimension compared to the other dimensions.

## 5. Conclusion

This research addresses the need for sector-specific sustainability reporting for the logistics sector. Developing sector-specific sustainability reporting requires identifying material topics, widely used indicators or the distribution of sustainability information in the sector reports. We conducted this study to identify what priorities should be given in terms of three dimensions of sustainability when reporting sustainable initiatives in the logistics sector. This objective was achieved through the research questions of what are the most widely used factors in each dimension of sustainability for the logistics sector and how equally information about sustainability initiatives is reported under the three dimensions of sustainability.

Findings provide important insights into sustainability reporting for logistics companies. It is clear that logistics operations impact the environment more. While the environmental dimension is apparently more important for the logistics sector, corporate sustainability reports focused more on social sustainability information. More material issues were also identified from the social dimension compared to the economic and environmental dimensions. This reveals that logistics sector companies prioritize addressing social sustainability issues raised from the environmental and economic impacts of their business operations. For instance, GHGs from fuel usage cause health issues for employees and local communities. Therefore, companies emphasize health and safety measures, security practices and compliance to deal with social issues raised from the environmental impacts. Another example is company engagement with the community or corporate social responsibility programs to communicate to stakeholders that they are committed to minimizing environmental and social impacts. From an economic perspective, companies focus on social issues such as labor management, customer



**Figure 3.**  
Summary of the material topics

satisfaction, customer complaints and employees' health and safety to save economic expenses. These factors emphasize that sustainability issues cannot be identified and addressed as an isolated concept, but are integrated and interrelated concepts along economic, environmental and social dimensions.

The findings suggest an important theoretical perspective regarding sustainability reporting from complexity theory. Although sustainability information is disclosed on the basis of prominent theories such as stakeholder theory and legitimacy theory, companies have responded to report sustainable information in a way that complexity theory suggests. It explains that companies do not respond to external pressures linearly (Wallis, 2013). As companies interact with multiple stakeholders, these interactions are interdependent and cause the system to be more complex (Bui and Baruch, 2010). Thus, companies try to respond to their economic, environmental and social issues in a nonlinear manner. This implies that sustainability information is reported on the basis of interrelated sustainability issues rather than prioritizing one dimension. This fact is also supported by Mitleton-Kelly (2011), stating that the business organization is multi-dimensional, therefore, the issues cannot be addressed by focusing on only a single dimension. Loorbach and Rotmans (2006) mentioned that the role of complexity theory in understanding and acting toward sustainability is that it emphasizes the overarching way of thinking. We can see this characteristic through our findings of sustainability reporting mentioned in the above paragraph. Additionally, because the complexity theory is considered the “theory of the multi-agent system” where the agency is attributed to all systems, subsystems and subsystem components, they all have authority to dominate system-level behaviors depending on the situation (Peter and Swilling, 2014, p. 1598). This feature of complexity theory highlights why companies use diverse measures in sustainability reporting. In theoretical contribution, this study unearths the greater link between complexity theory and sustainability reporting, which has not been explored in the previous literature to the best of our knowledge. Thus, this finding provides direction for future researchers to contribute to complexity theory in the context of sustainability reporting.

We also found that there is no consistency in the usage of sustainability measures in the logistics sector. Using diversified indicators from each dimension allows stakeholders to better understand the impact of organizational activities on sustainability. However, the lack of consistency in using these indicators inhibits us from comparing a company’s sustainability performance with that of its rivals. It also does not help in formulating policies at the micro-level and implementing sustainable strategies at the macro-level (Azapagic and Perdan, 2000). Therefore, more research is needed to strengthen the sector-specific sustainability indicators to ensure consistency of reporting and develop sustainable strategies and policies. We also found that logistics sector companies do not fully apply the GRI standard in sustainability reporting. This is because sustainability reporting is voluntary and not a requirement for companies. Some indicators in the GRI standard are widely used and some are not. This norm suggests that sector-specific sustainability indicators are needed. Our findings will contribute to determining sustainability indicators specific to the logistics sector.

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**Appendix**

Summary of sustainability indicators

Logistics  
sector

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Economic indicators	No. of reports
Direct economic value generated and distributed	29
Total revenue	27
Operating profit	23
Fair value estimation	14
Fair value of the net assets	10
Present value of obligations	7
Return on capital	6
Total assets	6

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**339****Table A1.**  
Summary of  
economic indicators

EBR 34,3	Environmental	No. of reports
<b>340</b>	<i>Emissions</i>	
	Direct greenhouse gas emission (Scope 1)	45
	Indirect GHG emission (Scope 2)	44
	Other indirect greenhouse gas emissions (Scope 3)	34
	Reduction of GHG emission	16
	Total greenhouse gas emission	15
	NO <sub>x</sub> and SO <sub>x</sub> and another significant air emission	15
	Total CO <sub>2</sub> emission	13
	Direct greenhouse gas emission intensity	11
	Reduction of CO <sub>2</sub>	11
	Energy indirect (Scope 2)	8
	CO <sub>2</sub> emission intensity	6
	CO <sub>2</sub> emission avoided	4
	Reduction of CO <sub>2</sub> per shipment	1
	<i>Energy</i>	
	Total energy consumption (direct/indirect)	33
	Reduction in energy consumption	12
	Energy efficiency	8
	Usage of renewable energy	6
	Energy purchase from renewable sources	5
	Energy intensity	4
	Renewable energy generated	3
	Solar energy capacity installed	2
	Energy savings	2
	Energy savings cost	1
	<i>Waste</i>	
	Total waste generated	17
	Total recycled waste %/tons	12
	Total hazardous waste	11
	Total weight of waste by type and disposal method	7
	% of non-hazardous waste	6
	Waste diverted from landfill	6
	Total waste sent to landfill	4
	Recycled material/cardboard and paper waste	4
	Weight of transported, imported, exported or treated hazardous	3
	Waste disposal at sea/disposal rate	3
	Total scheduled waste	3
	Waste recovered as %	1
	Total domestic urban waste	1
	Hazardous waste recovered	1
	Hazardous waste disposal	1
	Non-hazardous waste recovery	1
	Total waste discharge	1
	<i>Fuel</i>	
	The amount of fuel used/total fuel consumption	8
Tonnes of fuel saved/fuel saving in liters/in \$	6	
Fuel efficiency	4	
Fuel per shipment	1	
Potential fuel saving in %	1	
Heavy fuel oil (tonnes)	1	
Purchase of fuel and lubricants	1	

**Table A2.**  
Summary of  
environmental  
indicators

(continued)

Environmental	No. of reports	Logistics sector
Fuel use in transport	1	
Fuel use in building	1	
Use of fossil-free fuel	1	
% of alternative fuel	1	
<i>Water</i>		
The total water consumption	18	<b>341</b>
Total water withdrawal by source	13	
% and total volume of water recycled and reused	7	
Total water discharge by quality and destination	4	
Waste-water treatment/discharge	3	
The ratio of water to land space	1	
Installations of bulk water meters	1	
Reduced water cost	1	
Reduced water loss	1	

**Table A2.**

EBR 34,3	Social	No. of reports
<b>342</b>	<i>Health and safety</i>	
	Type of injury and rate of injuries	30
	Lost days/time	28
	Total no of work-related fatalities	22
	Absenteeism	22
	Occupational diseases	19
	Occupational accidents	7
	Health insurance and benefits	5
	occupational health and safety training	4
	Safety meeting with the participation	2
	Provisions for work-related injuries	1
	Number of health and safety audit	1
	Regular health examinations	1
	<i>Employees</i>	
	Total number of employees	26
	Total employees by gender	17
	No of full time and part-time employees	7
	Culture and diversity	6
	No of employees with disabilities	6
	% of employees covered by collective bargaining	5
	Benefits provided to full-time employees	4
	Code of conduct for employees	2
	No of direct and indirect employees	1
	Payments granted to employees	1
	Newly hired staff and staff turnover	1
	Liabilities toward employees	1
	Donations from employees	1
	Employee engagement	1
	Employee loyalty	1
	Employee hours volunteered	1
	Workload of the employees	1
	<i>Training</i>	
	Average hours of training per year per employee	21
	Training on anti-corruption policies and procedures	12
Total training hours by gender	11	
Total training hours	8	
Number of courses/workshops conducted	3	
Total leadership training	2	
Safe and eco-drive training	2	
Training and ethical commitment	2	
Number of training programs	2	
Specific training programs	1	
Regular training and education offer	1	
Formal training courses presented to staff	1	
Committees on training welfare and benefits	1	
Partnerships with universities: technological and managerial training	1	
Vocational training and other welfare assistance	1	
Employee training and talent development	1	
Provide mental health training	1	
<i>Local community</i>		
Customer satisfaction rate	5	

**Table A3.**  
Summary of social  
indicators

(continued)

Social	No. of reports	Logistics sector
Reported case of corruption and bribery	4	
Community satisfaction rate	3	
Total no of complaints	2	
No of complaints regarding ethical breaches	2	
Stakeholder engagement	2	
Investment in community programs	2	
Email marketing campaign	1	
Employee happiness index	1	
No of CSR initiatives	1	
Donation index	1	
No of security breaches	1	
		<b>343</b>

**Table A3.**

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