Audit Financiar, XXI, Nr. 3(171)/**2023**, *562-577*
ISSN: 1583-5812; ISSN on-line: 1844-8801

Sustainability of Business Models in Case of BSE Listed Firms

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Abstract

The depletion of natural resources and increased pollution represent an important problem that can greatly influence both the well-being of society and the security of its future. In this context, the concept of long-term and sustainable development is given even greater importance, through regulations that include in their scope more and more companies in which to implement and develop sustainable business models. The objective of this research is to illustrate the current practice regarding sustainability reporting, from the perspective of the most frequently approached themes regarding sustainable corporate growth. In the second plan, it is desired to outline an overview of the set of key words representative for the description of the sustainability aspects presented by the analyzed companies, which will thus contribute to increasing the degree of understanding of the concept, from the perspective of the many fundamental aspects captured. The analysis undertaken in the study is carried out at the level of a sample of companies listed on the Bucharest Stock Exchange (BSE) that are part of the BSE-NG index, specific to the energy and utilities sector. The basis of the research consists of 32 sustainability reports, analyzed between 2016-2022. The results of the undertaken study highlight the need for a more coherent and robust framework of non-financial reporting because in the analyzed reports a variety of topics are addressed, but presented unclearly, without making an exact delimitation between the main topics covered, considering the low level of the exclusivity indicator. The main reason is the way the content of the reports is structured, which addresses common issues in sections designed to approach specific topics. Also, the results highlight the fact that sustainability reports focus most of the time on the environmental aspects of the sustainable growth model, followed by the aspects regarding the alignment with the trends related to the innovative development, through the development and implementation of innovative solutions regarding the supply chain management.

***Key words**: sustainable model; non-financial reporting; sustainable development;*

***JEL Classification**: M42, M41, M48*

To cite this article:
Bunget, O. C., Dumitrescu, A.-C., Burcă, V., Bogdan, O. (2023), Sustainability of Business Models in Case of BSE Listed Firms, *Audit Financiar*, vol. XXI, no. 3(171)/2023, pp. 562-577, DOI: 10.20869/AUDITF/2023/171/021

To link this article:
http://dx.doi.org/10.20869/AUDITF/2023/171/021
Received: 30.05.2023
Revised: 22.06.2023
Accepted: 4.07.2023

1. Introduction

The concept of sustainability and sustainable development emerged as a response to the accelerated way of environmental degradation and from the need to minimize the negative impact that the activities of companies can have both on the community and the environment in which they operate (Brundtland Report, 1987). Starting from this premise, the global economy increasingly requires companies to define more clearly their economic, social and environmental role and objectives, so that they are able to demonstrate, in the most transparent manner, the ability to develop sustainable business.

With the increasing pressure exerted at the European level through new regulations developed in the sphere of sustainable development, more and more companies are aligning themselves with this trend and making progress in implementing innovative business models that ensure their sustainability.

But in the current context, sustainability no longer only means efficient consumption of resources, such as energy, recycling and protecting the environment. It also implies measures that must be implemented for the health of the community. From this point of view, companies, considered as the engines of economic development, have a major impact on social and ecological aspects in the long term. Thus, regardless of their field of activity, the change of perspective on sustainability in the business environment is strongly felt. The ability to quickly and successfully transition to new business models is an important competitive advantage and is also a lever in improving performance. Sustainable business models have great potential to incorporate the principles of sustainable development and integrate sustainability objectives into the activities undertaken, with the aim of creating added value (Boons and Lüdeke-Freund, 2013). Innovation in the field of sustainability thus represents a necessary capacity in the business environment, regardless of whether it is achieved progressively, through small steps, or on the contrary through radical, disruptive innovations.

Different industries and businesses have used the concept of sustainable business model to satisfy their economic, environmental and social aspects simultaneously, but research suggests that many business model innovations fail (Geissdoerfer et al., 2018), and the success, popularity and their progress are not clear and largely depend on the companies' field of activity (Nosratabadi et al., 2019).

Some studies undertaken (Nosratabadi et al., 2019) highlight the fact that the success rate of sustainable business models increases with the increasing use of advanced technologies that require the allocation of significant financial resources. It is well known that the decision to reinvest part of the profit to the community and the environment in which it operates is necessary to ensure the development of the company in a sustainable manner; but how do the entities report the aspects undertaken?

Our goal in this research is to illustrate the current practice regarding sustainability reporting, from the perspective of the most frequently approached topics regarding sustainable corporate growth. In the second plan, we have in mind the outline of an overview of the set of key words representative for the description of the sustainability aspects presented by the analyzed companies and thus, to increase the degree of understanding of the concept of sustainability, from the perspective of the many fundamental aspects captured.

The analysis undertaken in the study is carried out at the level of a sample of companies listed on the Bucharest Stock Exchange that are part of the BSE-NG index, specific to the energy and utilities sector. The basis of our research consists of 32 analyzed sustainability reports, between 2016-2022. The option regarding the chosen period is closely related to the implementation period of Directive 2014/95/EU, considering the fact that it was transposed in Romania in the second part of year 2016.

This paper is structured as follows: Section 2 presents the literature review and hypothesis development; Section 3 presents the research methodology, Section 4 discusses the results obtained, and Section 5 summarizes the main findings, conclusions and avenues for future research directions.

2. Specialized literature

Lately, it has been realized that the depletion of natural resources and increased pollution represent an important problem that can greatly influence both the well-being of society and the safety of its future. Sustainability, namely the process by which the needs of the present are satisfied without affecting the resources of future generations (Brundtland Report, 1987) represents a goal, an ideal, the fulfillment of which can only be achieved through a concept of sustainable development, which includes three fundamental pillars, respectively: economic,

environmental and social. Thus, the elements regarding the company's profit, the preservation of the environment and the well-being of people must be joined in an innovative business model, which must be permanently improved and which takes into account the entire value chain of the company both in the short, medium and long term (Emelian, 2023).

At the European level, more and more importance is being given to the legislation regulating aspects related to sustainability and sustainable development. In this direction, the European Parliament, in 2022, adopted the new directive regarding sustainability, a directive that modifies the current Non-Financial Reporting Directive, whose scope of applicability is considerably expanded, in response to the accelerated mode of environmental degradation.

Entities will thus be obliged to publish more information related to sustainability, information regarding business models, strategy and supply chains, with a particular emphasis on the connectivity between financial and sustainability statements, given the fact that the latter are more and more important for investors in substantiating the investment decision. The presentation of sustainability information must be done in such a way that it includes the concept of "double materiality", i.e. it presents, on the one hand, the impact of the entity's activities on the environment and society and, on the other hand, the external impact on the process of creating added value.

It seems that, in this context, the pressure to respond to sustainability concerns is increasing for companies, which are expected, on the one hand, to more actively address issues related to financial crises, economic and social inequalities, events of environment, material resource scarcity, energy demands and technological development as part of their strategic objectives. On the other hand, however, for the implemented sustainability practices to be successful, they must be part of the organizational culture and not be used only to improve the image in the market (Kam and Kim, 2022).

But how do companies report and implement sustainable development practices? The studies undertaken in the academic world highlight the fact that text-mining techniques represent real financial report research tools (Loughran & McDonald, 2016; Lewis & Young, 2019; Bochkay et. al., 2022), through which could be analyzed the style of expression, complexity of reports, association of words, sentiments (based on predefined words set), or the most important themes/subjects addressed within the reports. Such text-mining techniques have also been used on non-financial reports, thus there are studies that highlights the fact that through certain topics used in non-financial reports companies highlight their commitment to economic, environmental and social sustainability. An example of this is the research undertaken by Szekely and vom Brocke (2017) based on 9,512 reports of sustainability published between 1999 and 2015. Their results highlight that sustainability is a concept defined through 42 common topics by companies operating in sectors such as financial services, energy, mining, food and beverage. Their observations highlight the fact that the entities report the aspects regarding sustainable development, and the topics regarding ecological, social and economic sustainability are equally distributed within the reports. In terms of environmental sustainability, companies report, in particular, aspects regarding emissions and energy consumption. In terms of social sustainability, organizations report on work practices and customer orientation, and economic sustainability reporting is based on recorded financial data. Another study (Stanislavská et al., 2023), more recently, carried out on sustainability reports published in 2020 in the United Nations Global Compact database, highlights the fact that sustainability is viewed differently depending on the degree of development of the country. In general terms, the sustainability reports addressed three main topics related to human rights, diversity, equity, inclusion and sustainable production. However, sustainability reports in developing and developed countries have incorporated different communication strategies. Based on the prevalence (rate of occurrence) of content, sustainability reports from developed countries addressed topics related to "sustainable production", "emissions" and "supply chain," while sustainability reports from developing countries addressed, more frequently, aspects related to "education" and "human rights".

Also, the thematic content of the reports may be different when a company issues an integrated report compared to the situation in which it decides to issue an independent sustainability report. Specifically, there are studies that show that for a set of stand-alone sustainability reports, companies disclose relatively more environmental and social issues compared to what they present when they prepare an integrated report. Readability is generally low for integrated reports and much lower for separately prepared sustainability reports (Bostan, 2022).

3. Research methodology

The main objective of the undertaken study is to illustrate the current practice regarding sustainability reporting, from the perspective of the most frequently approached themes regarding sustainable corporate growth. In the second plan, we intend to outline an overview of the representative set of keywords for the description of the sustainability aspects presented by the analyzed companies. In this way we intend to increase the degree of understanding of the concept of sustainability, from the perspective of the many fundamental aspects captured by this extremely complex concept.

The analysis undertaken in the study is carried out at the level of a sample of companies listed on the Bucharest Stock Exchange. The selected companies are part of the BSE-NG index, representing an index specific to the energy and utilities sector. Of the 10 companies included in this index, only in the case of 7 such companies have we identified published sustainability reports, bearing in mind that in the case of two companies, Rompetrol Rafinare S.A. and Rompetrol Well Services S.A., the same group sustainability report was published. We emphasize the fact that, in the case of the companies Conpet S.A. and Oil Terminal S.A., we have not identified any independent sustainability report.

The option for the analysis of listed economic entities included in the BET-NG index is justified by the perception outlined in the technical literature, according to which the degree of transparency of economic entities regarding the achievement of sustainable development objectives is correlated with the extent to which the field of activity in which the entity operates is known to be controversial. Garcia-Meca & Martinez-Ferrero (2021) point out that there are fields of activity known for the major negative impact on the environment and society respectively, in violation of some fundamental principles of business ethics, among which we mention the arms industry, the pharmaceutical industry, or even the energy sector. In this context, multinational corporations, listed on the stock exchange, which operate in controversial fields from the perspective of negative implications regarding the achievement of sustainability objectives, are more prone to increasing corporate transparency through sustainable corporate reporting (Elalfy et. al., 2021).

At the same time, we emphasize the fact that the selection of economic entities analyzed takes into account the outline of the best sectoral practices, considering the fact that these entities have the necessary resources to develop robust non-financial reporting frameworks. Last but not least, given that they are listed on the local capital market, there is greater pressure from shareholders and other interested market players. Last but not least, we recall the relevance of the energy sector in light of the changes in the economic environment in the last five years, considering the implications of the COVID 19 pandemic or the effects of the war between Russia and Ukraine, which led to the emergence and amplification of an inflationary spiral at the level regional.

Figure no. 1. BET-NG evolution, compared with BET and BET-FI

Source: www.bvb.ro/FinancialInstruments/Indices/IndicesProfiles.aspx?i=BET-NG

In ***Figure no. 1*** we show the evolution of this BET-NG index, illustrating a sensitive association with the evolution of the BET index and, respectively, with the evolution of the BET-FI index. Basically, the impact of the energy sector in the degree of achievement of the sustainability objectives proves to be significant, as the energy sector generates externalities and economic effects at the level of other sectors of activity. An eloquent example in this direction is the financial sector, which aligns with the objectives of streamlining the energy sector and optimizing the consumption of energy from alternative sources, through the development of financing solutions classified in the green finance area (Liu & Wu, 2022).

Thus, we arrive at a total sample of 32 analyzed sustainability reports, for the period 2016-2022, among companies operating in the energy and utilities sector. The option regarding the chosen period is closely related to the implementation period of Directive 2014/95/EU, considering that it was transposed in Romania in the second part of year 2016. The option for the activity sector was taken from the perspective of the desire to illustrates as best as possible the specifics of a field that has been in the spotlight in recent years, against the backdrop of the current energy crisis.

The analysis of sustainability reports is carried out by using text-mining methods and techniques, following several levels of analysis, by performing several steps. Text-mining tools have proven to be true financial report research tools (Loughran & McDonald, 2016; Lewis & Young, 2019; Bochkay et. al., 2022). Among the most used text-mining techniques in the field of corporate report research are: expression style analysis, report complexity analysis, word analysis, word association analysis, sentiment analysis (based on the predefined words set) or content analysis regarding the most important themes/subjects addressed. In this study, we proceed to the analysis of sustainability reports, following the recommendations of Bochkay et. al. (2022), through keyword analysis, and respectively, the analysis of the main themes addressed in the evaluated sustainability reports.

The first step of the analysis consists in revealing the key words, emerging from the analyzed sustainability reports, from the perspective of the frequency of use in their elaboration. Through this text-mining technique, the aim is to score the most frequent words used in the analyzed sustainability reports, which highlights the increased attention given to some key aspects regarding the business model, the determining factors and the ways to achieve the objectives of sustainable growth.

The second step consists in evaluating a list of filtered keywords based on the technical literature review, which are classified according to the main pillars defining the concept of corporate sustainability, respectively: economic, ecological, social and last but not least, corporate governance. This step is followed to check to what extent the keywords in the sustainability reports provide relevant clues about sustainability issues from all its defining perspectives. So this analysis helps us understand to what extent key words revealed in the definition of the concept of sustainability at the level of technical literature are among the most frequently used words in the preparation of sustainability reports. This association analysis helps us outline the degree of understanding of the concept of sustainability and how it is translated among the preparers of sustainability reports.

The last stage of the analysis of the sustainability reports consists of an analysis of the central themes scored, with help of the Latent Dirichlet Analysis methodology (Lougharn & McDonald, 2016; Kang & Kim, 2022). The LDA technique is based on Bayesian computational analysis that abstracts from the structure of the analyzed sustainability reports. The principle from which it starts is the clustering of words that outline latent abstract constructions (constructs) that describe generic messages illustrated by a group of more or less correlated words.

Formally, this technique starts from the following notations:

- a list of words *V*, used at the level of the analyzed text corpus: $\{1, \dots, V\}$;
- a document containing N_w words designated by the vector $\boldsymbol{w} = (w_1, w_2, \dots, w_N)$;
- an aggregated text (corpus), composed of the concatenation of the *M* analyzed documents, symbolized by the vector $D = \{\boldsymbol{w_1}, \boldsymbol{w_2}, \dots, \boldsymbol{w_M}\}$;
- the number of words in the content of the aggregated text, given by the relation $N = \sum_{i=1}^{M} N_i$;
- the number *K* of topics extracted;
- the initial positive weight of the topic k in the document is α_k, $k = \{1, \dots, K\}$;
- the initial positive weight of the word w_n in document ***w*** is β_n, $n = \{1, \dots, N\}$;

- the probability $\varphi_{k,w}$ of the word w_n appearing in the topic k;
- φ_k representing the distribution of words in the topic k;
- $\theta_{w_n,k}$ representing the probability that the topic k appears in the document w_n;
- The distribution of topics extracted in the document w_n is used by the notation θ_{w_n}.

Through the LDA technique of text analysis of sustainability reports we obtain a distribution of words on each extracted topic. This technique takes into account several statistical premises, respectively:

- the distribution of words in each document follows a distribution $N \sim Poisson\ (\varepsilon)$;
- the distribution of topics extracted in each document ***w*** follows a Dirichlet distribution $\theta \sim Dir\ (\alpha)$, used in the modeling of mass distribution functions, having the property $\theta_i \geq 0, \sum_{i=1}^{k} \theta_i = 1$;
- for each word in the text:
  - each extracted topic describes a multinomial distribution $z_n \sim Multinomial\ (\theta)$, at the level of each analyzed document;
  - word-specific w_n multinomial probability is determined $p(w_n | z_n, \beta)$, conditional on the topic z_n; this probability is given by the order statistical average k of the random variable θ, described by the following probability density:

$$p(\theta \mid \alpha) = \frac{\Gamma\left(\sum_{i=1}^{k} \alpha_i\right)}{\prod_{i=1}^{k} \Gamma(\alpha_i)} \theta_1^{\alpha_1 - 1} \cdots \theta_k^{\alpha_k - 1}$$

where α is a dimensional vector k, with strictly positive components $\alpha_i > 0$.

The analysis of corporate sustainability reports using the LDA technique consists in generating a set of keywords associated with each key topic addressed in the analyzed sustainability reports. The analysis is based on the body of the text that integrates all the analyzed sustainability reports, generically called *corpus* in the technical literature. Once the keywords associated with each key topic are generated, we proceed to formulate a generic title for each topic based on the most representative keywords associated with it.

Afterwards, the analysis of the entire corpus is directed to the analysis of some quantitative indicators, specific to each key topic extracted, which provides a clearer picture of the existence of some patterns at the level of the style of expression used in the elaboration of the analyzed sustainability reports. These patterns regarding the style of writing sustainability reports provide extremely useful clues regarding the creation of established practices at the level of the economic sector. By these, we mean: clues about the clear separation of key topics in the structure of sustainability reports, the reporting of information with the help of short words, or the use of keywords that help to clearly separate key topics.

4. Results and discussion

4.1. Relevant aspects captured in sustainability reporting

The first step of the analysis within this study consists in evaluating the frequency of use of the most frequently used keywords associated with the concept of sustainability, at the level of the analyzed sustainability reports. For this purpose, we summarize in **Table no. 1** information on the frequency of occurrence of these words, considering two levels of analysis.

On the left side of **Table no. 1** are presented keywords associated with the concept of sustainability that have the highest frequency of appearance at the level of the analyzed sustainability reports, and which are found at least once in each of these reports. Based on this information, we observe that the most frequent keyword used in all the analyzed sustainability reports is the one regarding "waste", often associated with the word "residues", closely followed by the keyword "emissions" and the word "insurance", often associated with the word "biodiversity". These results suggest a particular attention given by the analyzed companies to environmental aspects, related to the actions taken by the management of the companies regarding waste management and, respectively, the reduction of carbon emissions and other types of emissions with a greenhouse effect. However, we note that sustainability reports also indicate an increased interest of companies towards the need for innovation at the product and process level. Companies operating in the energy sector are turning their attention to changing their portfolio of products and services designed to support

sustainability initiatives launched at the government level, in order to achieve global sustainable development targets. At the same time, increased attention is paid to initiatives launched by companies in order to optimize industrial processes and, respectively, distribution processes along supply-delivery chains, in order to reduce negative effects on the environment. Last but not least, these efforts consider improving working conditions and increasing the degree of motivation of the human factor, which has become essential in defining the concept of sustainability and implementing it in corporate practice. All these theses are achievable as long as the company's management is actively engaged in supporting sustainability initiatives throughout corporate processes and relationships with stakeholders, through increased corporate transparency and direct consultation with stakeholders (Gillet-Monjarret & Riviere-Giardano, 2016).

Table no. 1. Analysis of words frequency based on the review of sustainability reports

Highest frequency complete presence in reports analyzed			Highest frequency partial presence in reports analyzed		
Keyword	**Total occurrences**	**Occurrence/ Document**	**Keyword**	**Total occurrences**	**Occurrence/ Document**
waste	1413	27	fuel	923	24
emissions	1179	27	women	481	26
insurance	957	27	disclosure	695	17
innovation	635	27	engagement	448	23
personnel	422	27	skill	318	25
supply chains	414	27	biodiversity	317	26
pollution	388	27	goal	311	26
research	348	27	scope	299	21
hazard	342	27	certification	288	27
non-financial	329	27	disposal	244	27

Source: authors' projection

On the right side of **Table no. 1** are revealed keywords that have a large number of occurrences at the level of the analyzed sustainability reports, but only in certain reports. Among the most important such keywords, we note the words "fuel", "women", "commitment" associated with the word "objective", and respectively "skills" and "certification". Through the predominant use of these keywords, the company's management indirectly transmits various signals of alignment with the requirements for adjusting the business model, processes and specific operations to the principles of sustainable development, materialized through action directions, monitored by reporting on objectives target reflected by the SDGs. These directions illustrated in the sustainability reports prove to be extremely useful in evaluating the contribution of companies to the achievement of national, regional and global objectives regarding sustainable development, and respectively in the implication of management to engage in increased efforts regarding CSR activity (Ioannou & Serafeim, 2019). However, we must note that between these SDG objectives and the forms of sustainability reporting there is a bidirectional relationship of causality, also considering the implications of the SDGs at the level of the content presented through sustainability reports (Whittingham et. al., 2023), under pressure external factors of the company.

A reason why these keywords are not used in all the analyzed sustainability reports is indicated by the specificity of the analyzed companies' field of activity. If companies like OMV Petrom have in their field of activity divisions dedicated to the extraction and distribution of petroleum products, the same cannot be said about a company like Romgaz that operates mainly in the area of gas extraction and distribution.

Another reason is given by the option of the management of analyzed companies to point to the fulfilment of some objectives that address various directions of action agreed at the government level, such as the case of increasing the role of women in the management activity of these companies and the elimination of gender discrimination, with reference to the SDG 5 – Gender equality. Also, from the perspective of the analyzed keywords, we refer to the

companies' efforts to align with established practices at the sectoral level, by implementing environmental standards, intended to send positive signals among investors and other stakeholders regarding the quality of products and the functionality of industrial processes and organizational, in order to reduce the negative effects on the environment, with reference to SDG 12 - Sustainable consumption and production, or SDG 13 - Climate action. At the same time, the companies reveal information on how they ensure the attraction and maintenance of the human factor endowed with various professional skills aimed at ensuring the proper functioning of corporate processes regarding sustainable development and that make efforts to develop capabilities that give companies a competitive advantage, in an extremely dynamic economic environment, subject to an increasing number of constraints regarding the limited level of natural and financial resources, which sends us towards several SDG objectives, such as SDG 8 - Decent working conditions and economic growth, SDG 9 - Industry, innovation and infrastructure, SDG 4 - Quality education.

The list can go on, given that the business model of each company is predominantly related to a limited number of SDGs, at least from the perspective of management's option to outline a dimension at the level of the sustainability report closely related to the operational activity and particularities which derives. However, the content of these sustainability reports must be used with a dose of caution, considering the current challenges in the sphere of ensuring the quality of non-financial information, including through the certification (auditing) of sustainability reports (Stefanescu et. al., 2020; Ettah et. al., 2023), or the use of emerging technologies (Farcane et. al., 2021), especially in the context of a legislative framework that does not provide clear and coherent clarifications regarding controversial issues debated in the literature and among professionals involved in their development and certification. Caution must represent a fundamental element in the analysis and interpretation of these reports, all the more so as both professional bodies and regulatory bodies in the field of corporate reporting raise the issue of the proliferation of the regulatory forms of the corporate reporting framework (Monciardini et. al., 2020; Farcane et., al., 2021), and respectively the risk of losing the relevance of the information thus published, against the background of the practices (most of the time by the company management) to transform these sustainability reports into genuine ones sustainable marketing tools (Benameur et. al., 2023).

Last but not least, we must note that there is currently reluctance on the part of companies, especially small and medium ones, regarding the opportunity of sustainability reporting, from the perspective of economic implications, although the literature emphasizes an unanimously accepted opinion regarding the positive benefits generated by this type of corporate reporting (Liu & Wu, 2022). However, the regional efforts undertaken by the European Commission, together with the national authorities, launch increasingly visible initiatives that promote different forms of stimulating management to publish such reports, including by facilitating solutions in the area of green financing (Ozili, 2022). At the same time, clear initiatives to increase the degree of regulation of this type of corporate reporting are underway, whereby the integration of multiple sustainability reporting frameworks into a single regulatory solution is desired, as is the case with the IASB's efforts to create standards of sustainable reporting.

However, these efforts at the institutional level are not enough (Tsagas & Villiers, 2020), which is why companies must make their contribution by implementing corporate governance mechanisms and tools, aimed at ensuring alignment with the dynamics of the business environment and the requirements of sustainable development outlined at the level of capital markets (Benvenuto et. al., 2023), and to produce benefits for companies, at least from the perspective of increasing corporate transparency.

4.2. Forms of reporting the concept of sustainability

The second step of our analysis aims to illustrate the importance of some established terms, included in any list of keywords formulated in research that defines the concept of sustainability. In this sense, we start from the observations made at the level of literature, through which it is noted that this concept is insufficiently understood by professionals (Jain & Tripathi, 2022), which led to the perception that this concept primarily refers to environmental aspects specific to each company's business model (Costa et. al., 2022). In order to better outline the dimensions of a corporate sustainability reporting model, we have designed a list of keywords specific to sustainability reporting frameworks and the two European directives on non-financial reporting. In this direction, our analysis starts from the compiled list of keywords shown in **Table no. 2**. Through this list of keywords (bag-of-words), specific for corporate sustainability reporting models, we want to clearly,

concisely and coherently illustrate the conceptual elements of the following dimensions, respectively: the economic dimension, the ecological dimension, the social dimension, and not lastly, the corporate governance dimension. Thus, we follow the approach of Szekely & Brocke (2017), by which we want a clear delimitation of the fundamental, defining aspects of the concept of sustainability, with implications for the content of the analyzed sustainability reports. We consider such an analysis to be fundamental, given that the level of awareness of key concepts regarding sustainability reporting is still relatively low among companies, especially at the level of small and medium-sized companies (Christensen et. al., 2021).

Table no. 2. Keyword analysis from the perspective of the concept of sustainability

Economic	Total TD-IDF	Environmental	Total TD-IDF	Governance	Total TD-IDF	Social	Total TD-IDF
standardization	0.223	*waste*	0.359	*process*	0.395	*safety*	0.268
diversification	0.190	*lifecycle*	0.337	*technology*	0.345	*skills*	0.265
benchmarking	0.150	*consumption*	0.297	*collaboration*	0.297	*protection*	0.203
competitiveness	0.135	*certification*	0.214	*boundaries*	0.275	*trust*	0.196
recovery	0.114	*disposal*	0.208	*defining*	0.268	*accessibility*	0.182
crisis	0.112	*design*	0.205	*governance*	0.253	*health*	0.174
significance	0.108	*avoidance*	0.165	*assurance*	0.233	*social*	0.172
circular	0.096	*recycling*	0.135	*responsibility*	0.214	*energy*	0.162
suitability	0.067	*mobility*	0.096	*transformation*	0.202	*well-being*	0.147
viability	0.059	*sharing*	0.095	*regulation*	0.199	*experience*	0.145

Source: authors' projection

Based on the analysis of the textual analysis indicator TD-IDF, we note a greater attention to the environmental dimension and, respectively, to the governance dimension specific to the company's business model. From this perspective, we appreciate that the company's management wants to illustrate how important the environmental side is in the management of processes and the development of the portfolio of products and services. In this direction, they emphasize the importance of the actions taken in terms of monitoring and controlling operations, with a view to reducing waste, increasing the life cycle of the product, widening the universe of possibilities for recycling material resources, or optimizing distribution chains to ensure in optimal terms energy consumption at the level of the population and economic entities. These desired goals can be achieved by defining/redefining and the appropriate implementation of the processes intended to lead to the sustainable correlation of production with the demand expressed in the market, through which they establish quite clearly: tolerance intervals regarding certain types of consumption (expenses), budget limits, transparent levels of management approval, roles and responsibilities (RASI charts), aimed at ensuring the achievement of sustainable development objectives, etc. It should be noted that, probably also due to the specificity of the activity sector of the companies to be analyzed, the technologies used prove to be essential, representing tools of competitive advantage and, respectively, tools to facilitate the objectives of sustainable development and resilience in turbulent economic conditions. At the same time, we notice that more emphasis is placed on process description aspects in sustainability reporting, and less on internal regulatory aspects, through policies, procedures and guidelines, which indicates the importance of the human factor in the management and continuous improvement of processes, through internal cooperation efforts and with other external actors.

However, there is an increased interest of the companies also in terms of the social dimension, which mainly targets actions and measures taken by the management regarding ensuring the safety of consumers and respectively ensuring a continuous flow on the supply-delivery chain, in the context of the fluctuations that have occurred as a result of the restrictions imposed during the COVID-19 pandemic, or more recently, in the context of changes in the energy market determined by the outbreak of the war in Ukraine and geopolitical tensions at the regional level. At the same time, companies have begun to understand the crucial role of the human factor, which they present in their sustainability reports as a competitive factor, which they protect and commit to ensuring decent working conditions and an

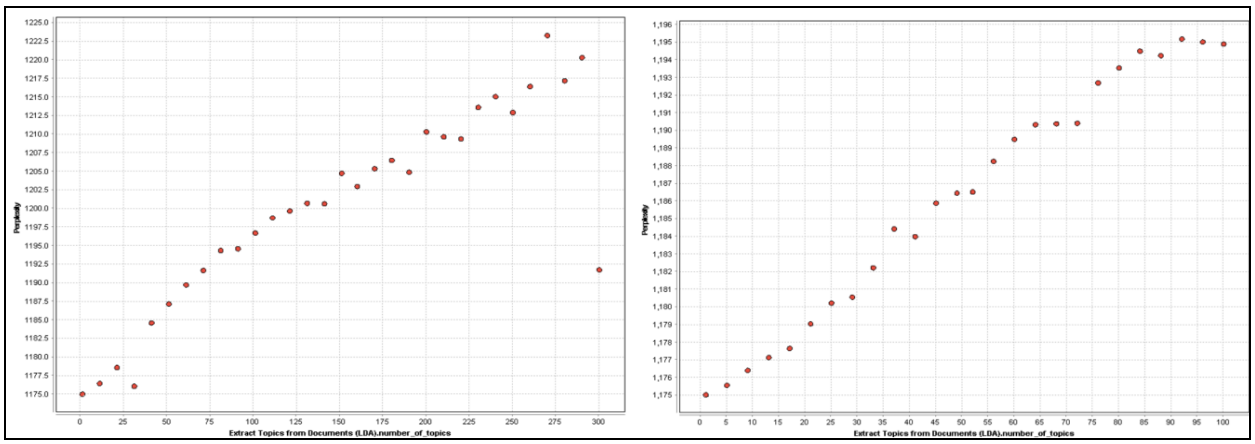
appropriate level of health. Last but not least, they also focus on shaping a public image, which should give confidence to stakeholders and investors alike. Through this relationship of trust, the company aims to increase the motivation of employees, the commitment of investors in the financing of capital projects regarding the sustainable development of the company, or the improvement of cooperative relations with public institutions or other stakeholders (Aureli et. al., 2020), in the context of a regulated energy market and regional pressures to achieve SDG targets.

4.3. Fundamental aspects revealed by sustainability reports

The final step of the analysis of the sustainability reports reviewed in this study consists in delineating the key thematic aspects addressed by the content of the sustainability reports.

Considering the large volume of information disseminated through these corporate reports, we preceded, in the first instance, to determine the optimal number of key themes disseminated, by referring to the largest analyzed report, namely the OMV Petrom report for the year 2022.

Figure no. 2. Perplexity scenarios analysis, based on different number of topics extracted



Source: authors' projection

From ***Figure no. 2*** we see an inflection point when we extract 300 topics at the level of the chosen sustainability report. This inflection point illustrates, in the case of the scenario of extracting a number of 41 topics, a level of the perplexity indicator of 1184.9, which is lower than the value of the same indicator, in the case of the scenario of extracting a number of 37 topics. Under these circumstances, we decide to extract a total number of 40 topics from the entire corpus formed by the analyzed sustainability reports.

Table no. 3. TOP 5 topics extracted, based on the hierarchy of LDA performance criteria

Topic ID	Topic	Keywords topic extracted	% of words per topic in overall corpus
32	Management vision and corporate communication	employees, sustainability, development, communication, project, construction, vision, health, potential, waste, events	2.11%
6	Energy use and environmental protection	development, energy, responsible, environmental, pollution, stakeholders, partnership, improve, reporting, reduce	2.13%
14	Operations efficiency	performance, employee, efficient, impact, transparency, activity, management, environmental, system, actions;	2.39%
11	Human capital compensation	employee, remuneration, impact, actions, resources, conduct, safety, competition, training, regulation, cultural	2.63%
15	Markets and product quality	market, services, quality, information, professional, emergency, ethical, clients, health, OPCOM.	2.13%

Source: authors' calculation

Among the themes extracted at the level of the analyzed corpus, we note that the theme regarding the security of distribution systems, and implicitly the contribution of companies to national energy security, is the most common at the level of the sustainability reports analyzed. Considering the activity specifics of the analyzed companies, this topic turns out to be predominant in relation to other topics addressed at the level of 5 sustainability reports, out of the 29 sustainability reports analyzed. This theme is followed by the theme of reporting operational performance indicators on energy production, which is predominant in a similar number of sustainability reports. Thus, the companies intend to illustrate the effectiveness of strategies for securing the supply-delivery chain, with the aim of reducing possible blockages, with significant economic implications at the level of household consumers, and especially at the level of economic entities with industrial production activities.

In **Table no. 3** we illustrate the top 5 topics addressed at the level of the sustainability reports analyzed, starting from their ranking according to the decreasing value of the coherence and exclusivity indicators.

From the perspective of these results, we conclude on the importance given by management to the role of sustainability reports, through which they want to convey fundamental aspects regarding the company's strategic vision, outlined by major investment directions, alignment with initiatives to reduce the negative effect of operational activity on the environment, and overall promotion of sustained sustainable growth efforts.

This theme is closely related to the following theme, frequently described in sustainability reports, namely the theme regarding the responsible production and consumption of energy, described to the same extent by the global targets regarding SDG 7, SDG 12 and SDG 13. Through the theme regarding production and responsible energy consumption, companies draw the main measures to reduce the negative effects on the environment, especially through the most appropriate planning, through continuous communication with stakeholders, or through the consolidation of strategic partnership relationships in order to carry out coordinated actions regarding this responsibility at the level of energy production.

The following 3 extracted themes, included in the top 5 most relevant themes at the level of the chosen sustainability reports, can also be found in **Table no. 4**, in which we retained some of the most relevant themes mentioned at the level of the technical literature, regarding the preferences of company management in the development of sustainability reports (Szekely & Brocke, 2017; Bickel, 2019; Manes-Rossi & Nicolo, 2022). This time, we tried to associate these themes with one of the 4 dimensions that we follow in our study, in order to define the universe of understanding of the concept of sustainability and the expectations regarding the categories of information that should be published through sustainability reports, at the level of the energy sector. At the same time, we associate each theme with an SDG objective, depending on the weight of the most frequent words used within each extracted and analyzed topic. The results obtained confirm the observations made at the level of content analysis of sustainability reports, from the perspective of the frequency of keywords and the most frequently used words.

At the level of the economic dimension, companies transmit, through sustainability reports, information that provides a better understanding on the part of stakeholders regarding the way of using material and financial resources, in order to optimize financial results, and at the same time to increase market share, improve quality the products and services offered, or the alignment with the legal regulations at the level of the energy market.

Table no. 4. Analysis on relevant topics extracted with LDA methodology

ESG pillar	Topic ID	Topic	Keywords topic extracted	Related SDG	% of all words in topics extracted	% of words per topic in overall corpus
Economic	14	Operations efficiency	performance, employee, efficient, impact, transparency, activity, management, environmental, system, actions;	SDG 8, SDG 12	11.92%	2.39%
	15	Markets and product quality	market, services, quality, information, professional, emergency, ethical, clients, health, OPCOM.	SDG 4, SDG 7, SDG 8, SDG 9, SDG 16	15.58%	2.13%

ESG pillar	Topic ID	Topic	Keywords topic extracted	Related SDG	% of all words in topics extracted	% of words per topic in overall corpus
Environment	13	Security of distribution systems	transmission, electricity, system, activity, national, security, management, power, environmental, network;	SDG 9, SDG 11, SDG 17	12.34%	3.16%
	24	Waste management	monitoring, waste, internal, management, materials, consumption, procedures, resolution, policy, system.	SDG 8, SDG 12	11.38%	2.54%
Social	11	Human capital compensation	employee, remuneration, impact, actions, resources, conduct, safety, competition, training, regulation, cultural	SDG 3, SDG 4, SDG 8	8.97%	2.63%
	30	COVID 19 strategy and process alignment	health, pandemic, change, scope, compliance, report, management, sustainability, board, COVID 19	SDG 3	12.45%	2.72%
Governance	2	Management accountability	protection, requirements, operations, systems, security, management, performance, approve, mandate, KPIs;	SDG 8	10.68%	2.58%
	5	Supply chain operations governance	reporting, safety, governance, customer, chain, employee, organization, committees, environmental, future;	SDG 8, SDG 12, SDG 17	17.24%	2.80%
	9	Environmental operations governance	nuclear, environment, power, directors, management, water, authorization, fuel, activities, plant;	SDG 6, SDG 12, SDG 8	16.65%	2.54%
	10	Process and performance monitoring	environmental, performance, energy, safety, audit, continuously, framework, management, objectives, process	SDG 3, SDG 8, SDG 12	11.80%	2.11%
	12	Compliance and business conduct	employee, management, activity, professional, relationship, compliance, environment, corruption, protection, material	SDG 4	15.74%	2.39%
	21	Corporate policy and risk management	company, group, safety, information, services, policy, period, risk, procedures, impact, sustainability, supply	SDG 8	11.15%	1.77%
Reporting	17	Sustainability reporting framework	GRI, directors, sustainability, gas, report, water, financial, environmental, natural, branch, energy	all	18.01%	2.45%
Technology	23	Risk management, innovation and digitalization	risks, performance, sustainability, carbon, operations, people, innovation, governance, transition, digitalization	SDG 4, SDG 8, SDG 9, SDG 13	23.50%	2.96%
	26	Innovative technologies along the supply chains	energy, electricity, system, grid, technology, management, risk, renewable, integration, strategy, context, capability	SDG 7, SDG 9 SDG 17	15.83%	2.40%

Source: authors' calculation

At the level of the ecological dimension, the attention of analyzed management companies is mainly directed towards the measures taken regarding the contribution to the national objective of ensuring energy security, by ensuring a continuous flow of energy distribution, without encountering significant interruptions in the supply-delivery chain, under the conditions of meeting clear objectives of environmental protection and responsible production.

The social dimension of the analyzed sustainability reports is defined, especially by referring to the preference of the companies' management to send signals to investors and other stakeholders regarding the appropriate level of motivation and remuneration of employees, including their involvement in continuous professional training activities, remuneration them based on their professional performance evaluated in close connection with the strategic and operational objectives of the companies, or by shaping an organizational culture that promotes common principles and values with employees and business partners. Although less present in sustainability reports, the topic of companies' response to the effects of the COVID-19 pandemic is also covered. However, this theme is rather described through the lens of the degree of compliance with legal requirements, occupying little space in the economy of the content of the sustainability report.

A considerable space in the sustainability report is given to governance aspects, thus giving companies' management the

opportunity to describe the area of action in which they have control, with less interference from external factors compared to the other dimensions analyzed. The management of the company traces through this dimension, the ways in which it exercises an adequate level of monitoring and control (through various mechanisms and tools of corporate governance, such as policies, procedures, functional processes of change management, code of ethics and business conduct, technological capabilities regarding information systems, internal control systems, etc.) regarding the achievement of the strategic objectives of the company, which should lead to the achievement of the targets regarding the regional sustainable development objectives, at least from the way the information is presented. However, there are studies that indicate that the way the SDG objectives are described in sustainability reports does not address the extent to which the company contributes to achieving sustainable development targets (Mio et. al., 2020; Alsayegh et. al., 2023), especially in the case of companies operating in highly developed countries, where the political factor strongly promotes sustainability initiatives (Biermann et. al., 2022).

The last sections mentioned in **Table no. 4** refer to two crucial, amplifying elements in obtaining net benefits from alignment with sustainability principles, values and practices, including the design and implementation of corporate sustainability reporting models.

The sustainability reporting section refers to clarifications regarding the reporting framework used in the development of sustainability reports, by referring mainly to the GRI reference. Thus, by creating a clear structuring of the sustainability report, and by aligning with a sustainability reporting benchmark, the information disseminated in this way can be given relevance, especially from the perspective of comparability over time, at the sector level, at the capital markets level. This topic usually refers to the materiality aspects and the checklist of the degree of coverage of the minimum information requested by the GRI standards at the level of the content of the sustainability report. At the same time, this topic addresses a current issue regarding sustainability reporting, namely the quality of the information presented, from the perspective of the content of the audit opinion on material aspects.

The last-mentioned section refers to the innovation factor in the equation of sustainable development at the corporate level. Thus, aspects regarding the reduction of risks through the implementation of technologies or other innovative solutions, the degree of integration of information systems, or the alignment of strategies with the dynamic capabilities of companies, become fundamental elements in ensuring a sustainable growth. It should be noted that this side of the sustainability activity does not prove to be equally important for all the analyzed companies, considering the relatively low level of the entropy indicator related to topic 26. The aspects regarding the implementation and use of innovative technologies are better described at the level of the sustainability reports published by Electrica S.A. and Transelectrica S.A., compared to the reports published by Rompetrol S.A. or OMV Petrom S.A. However, we must emphasize the fact that the variety of vocabulary and, respectively, the degree of detail of certain topics within the sustainability reports leads to these unexpected results, which is why we cannot appreciate that a company like OMV Petrom does not adopt innovative technologies. At the same time, we underline the fact that these results are sensitive to the number of reports analyzed for each company, to the size of the sustainability reports, or even to the weight of representing information through graphics, preferred in some cases, to the detriment of information presented in narrative form.

4.4. Diversity in corporate sustainability reporting

In **Table no. 5** we present the most important indicators calculated to evaluate the degree of addressability and the specificity of the topics extracted from the analyzed sustainability reports.

Table no. 5. Topic performance analysis

	coherence	*word length*	*exclusivity*	*entropy*	*no. of words used*	*key topic words*	*uniform distance*	*corpus distance*
Mean	-61,02	7,418	0,286	2,438	189	12.487	3,924	2,000
Std. Dev.	28,89	0,735	0,076	0,617	69	2.265	0,234	0,143
Min.	-145,7	5,800	0,175	0,821	46	8.863	3,665	1,670
Max.	-27,44	8,900	0,481	3,191	292	18.397	4,564	2,340
Count	40	40	40	40	40	40	40	40

Source: authors' calculation

These results help us create a series of observations, with practical implications for the management of companies in similar sectors, or of similar size. Among them we mention:

- ✓ the length of the text addressed by each individual topic, by reference to the number of words used (*key topic words*), turns out to be relatively similar at the level of the extracted topics; however, there is heterogeneity at the level of the number of words used in the description of each extracted topic, show by the effective number of words indicator, which may suggest an unequal importance given in the description of the topics, along the sustainability report;
- ✓ it is used a language that facilitates the understanding of the transmitted message, by using short words, described by the *word length indicator*;
- ✓ the relatively homogeneous level of the *uniform distance* indicator shows that the topics covered do not use specific keywords, but common words, common to the other topics extracted; similar indications are provided by the *corpus distance indicator*, which reveals the fact that the list of keywords obtained from the LDA analysis, for each topic extracted, is equally representative, regardless of the topic analyzed;
- ✓ the extracted topics present a fairly large standard deviation, which suggests that the analyzed sustainability reports present an increased level of variety of topics addressed; however, these themes are presented unclearly, without making a clear delimitation between the main themes addressed, considering the low level of the exclusivity indicator; the main reason is the way the content is structured, which addresses common issues in sections designed to address specific topics;
- ✓ there is a wide variety in the extracted themes, given the notable differences in the coherence indicator; thus, some topics are presented robustly, by using terms that correlate at the level of the entire sustainability report, while other topics are presented very vaguely, in several ways of formulating the information.

5. Conclusions

Non-financial reporting is a subject of interest, firstly because an innovative business model can contribute to the long-term and sustainable development of the company, and secondly because it can be a competitive advantage in a business world in which there is fierce competition.

Through the study undertaken, we aimed to highlight the current practice regarding sustainability reporting, from the perspective of the most frequently approached themes regarding sustainable corporate growth. In the second plan, we had in mind the outline of an overview of the representative set of keywords for the description of the sustainability aspects presented by the analyzed companies and thus, to increase the degree of understanding of the concept of sustainability, from the perspective of the many fundamental aspects captured.

The analysis undertaken in the study was carried out at the level of a sample of companies listed on the Bucharest Stock Exchange that are part of the BSE-NG index, specific to the energy and utilities sector. Our research was based on 32 analyzed sustainability reports, in the period 2016-2022.

The results of our study highlighted the fact that the analyzed sustainability reports present a variety of topics addressed that are presented unclearly, without making an exhaustive delimitation between the main topics addressed, considering the low level of the exclusivity indicator, perhaps due to the way structuring the content, which addresses common issues in sections designed to address specific topics.

At the same time, we note that the sustainability reports focus most of the time on the environmental aspects of the sustainable growth model, followed by the aspects regarding the alignment with the trends regarding innovative development, through the development and implementation of innovative solutions regarding supply chain management. Last but not least, we note increased attention paid to the adoption of innovative technologies at the level of operational processes, precisely to reduce environmental risks and negative economic effects. However, we notice an approach oriented towards the need to transmit positive signals at the level of the capital market, which can induce concerns about the veracity of the informational content of the analyzed sustainability reports, especially in the context where there are currently serious fears about at the limits of current sustainability reporting service solutions.

All these key topics are highlighted in at the level of sustainability reports, pointing out strong aspects of the corporate governance mechanisms, through which management and shareholders alike express their commitment to the objectives of sustainable development, oriented towards the customer's need, the reduction of the waste of material resources and, respectively, the motivation and protecting the human factor.

These results propose for debate a series of elements of weakness regarding the current models of sustainable reports, in the context in which the CSRD directive will be transposed in the next period and at the level of national legislation. The need for a more coherent and robust non-financial reporting framework is signalled through this study, given the increased proliferation of corporate sustainability reporting. At the same time, creating an analytical model for evaluating the content of sustainability reports is becoming more and more useful, similar to the GRI sustainable reporting index, but more closely correlated with the materiality matrix drawn at the level of the sustainability report. Last but not least, we consider it fundamental to launch an information and consultation campaign, by professional bodies and public authority, aimed at bringing clarifications among professionals, aimed at aligning professional practice and the regulatory framework to a common denominator.

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