European research on management and business economics 29 (2023) 100211

European Research on Management and Business Economics

www.elsevier.es/ermbe

# Evaluation of non-financial information and its contribution to advancing the sustainable development goals within the Spanish banking sector

Francisco Aguado-Correa[a,*], Juan José de la Vega-Jiménez[a], José María López-Jiménez[b], Nuria Padilla-Garrido[c], Inmaculada Rabadán-Martín[a]

[a] Department of Financial Economics, Accounting and Operations Management, Faculty of Business Sciences and Tourism, University of Huelva, Plaza de la Merced, 11, 21071 Huelva Spain
[b] Department of Civil Law, Ecclesiastical State Law of the State and Roman Law, Faculty of Law, University of Malaga, Campus de Teatinos, 29071 Málaga Spain
[c] Department of Economics, Faculty of Business Sciences and Tourism, University of Huelva, Plaza de la Merced, 11, 21071 Huelva Spain

ARTICLE INFO

*Article History:*
Received 23 February 2022
Revised 13 December 2022
Accepted 14 December 2022
Available online xxx

*Keywords:*
Sustainability
Banks
Non-financial information report
SDGs
Natural language processing

*JEL classification:*
C02
G21
K32
M14
Q01

ABSTRACT

Non-financial information and its contribution to the achievement of each Sustainable Development Goal (SDG) are assuming great relevance in the business world, in which it is not enough to be economically sustainable without also being sustainable from ethical, environmental, and social points of view. An analysis of how the financial sector contributes to the achievement of the SDGs is crucial in two ways. Firstly, due to the relevance and the magnitude of this sector itself; secondly, and more importantly in our view, because of the financial leverage of the banking sector that has a mandate to facilitate the transition of all economic sectors towards sustainability, guided by the 2030 Agenda. However, despite the expectations placed on banking entities, there is a research gap on their disclosure practices and on the SDG-related information that they report. In addition, the academic literature centered on the analysis of SDG-related disclosures through artificial intelligence is very scarce. To fill this gap, the objective of our study is, on the one hand, to analyze whether there is greater homogeneity in the disclosure of non-financial information in the Spanish banking sector following the transposition of Directive 2014/95/EU into Spanish Law. On the other hand, it is to evaluate the contribution of banking entities to the SDGs. To do so, the non-financial information reports of 12 Spanish banks are analyzed, completing a comparative evaluation and using artificial intelligence to identify mentions of each SDG and its targets. The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was also used to rank the banking entities in accordance with their contribution to each SDG. The results reflected the plurality, in both breadth and quality, in the disclosure of non-financial information and in the contribution to the SDGs. The only point in common between all the entities that were studied was the use of the GRI disclosure framework and the identification of the priority SDGs, positioning SDGs 8, 13, and 4 in priority positions. The banks with higher bank capitalization levels occupied the top of the ranking of contributions to the SDGs. Differences were presented for all other aspects, even to the point of highlighting that some entities or independent verifiers had not offered all the information. In conclusion, greater efforts to improve the quality of non-financial reporting and further development of the common regulatory framework will be fundamental for better comparability between the reports from banking entities. Furthermore, this study shows that natural language processing can be applied to better measure companies' alignment with the SDGs based on the text of their non-financial reports.

© 2022 The Author(s). Published by Elsevier España, S.L.U. on behalf of AEDEM. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

## 1. Introduction

The adoption of Directive 2014/95/EU on the disclosure of non-financial and diversity information (referred to as the 'Non-financial Reporting Directive' – NFRD) set the European Union (EU) on a clear course towards greater business transparency and accountability on social and environmental issues. The Directive serves as a vital instrument in terms of advancing the Corporate Social Responsibility (CSR) of the EU (European Parliamentary Research Service, 2021).

However, even though the Directive has implied a remarkable advance, insofar as its purpose is to guarantee both the coherence and the comparability of the non-financial information that firms disclose, several shortcomings have been noted in the current text of the NFRD and in its implementation. A public consultation, launched between February and June 2020, which was aimed at collecting the

* Corresponding author.
*E-mail address:* agucor@uhu.es (F. Aguado-Correa).

https://doi.org/10.1016/j.iedeen.2022.100211
2444-8834/© 2022 The Author(s). Published by Elsevier España, S.L.U. on behalf of AEDEM. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

views of stakeholders with regard to a possible revision of the NFRD, identified several shortcomings in the implementation of the NFRD, relating for instance to a lack of comparability, reliability, and relevance in the disclosure of non-financial information (European Parliamentary Research Service, 2021).

Among the causes of these shortcomings is, in the first place, the fact that the NFRD in no way defines what must be understood by non-financial information. In this respect, the study of Tarquinio and Posadas (2020) established that the meaning of non-financial information is ambiguous and multifaceted, as neither a common understanding nor a single and generally accepted definition of the term exists. van Duuren, Plantinga and Scholtens (2016) found that European managers view Environmental, Social and Governance (ESG) in substantially different ways. Moreover, Baldini, Maso, Liberatore, Mazzi and Terzani (2018) argued that country-specific factors such as governance, labor, and economy have significant effects on ESG disclosures among firms.

Secondly, no formal standard for the systematization and the disclosure of information accompanied the NFRD that was not in itself overly specific in terms of requirements, which conferred a degree of flexibility on member States in their transpositions (Nicolò, Zampone, Sannino & De Iorio, 2021; Szabó & Sørensen, 2015), permitting them to impose specific requirements on firms in relation to three fundamental aspects of the information: the format, the framework, and the content of the information (Aureli, Salvatori & Magnaghi, 2020; Mio, Fasan, Marcon & Panfilo, 2020). A situation that can lead to both excessive autonomy of the corporations that are obliged to report and heterogeneity of disclosure practice, given that the firms can follow the normative framework (GRI, CDP, CDSB, IIRC, SASB, *etc.*) that is best adapted to their own characteristics. In addition, there is a lack of convergence between regulators and standard-setters, as well as leading sustainable firms (Stolowy & Paugam, 2018).

Thirdly, although the NFRD requires companies to prepare a non-financial report containing information, at least on environmental and social questions as well as human rights and the fight against corruption and bribery, nothing is said of a minimum quality level for information disclosures. The quality of sustainability reporting affects such factors as the credibility of accountability and building up stakeholder confidence in a company (Mion & Loza, 2019). Even so, different legislative experiences throughout the world have not clarified whether mandatory non-financial disclosure improves the quality of non-financial statements (Agostini, Costa & Korca, 2022; Bebbington, Kirk & Larrinaga, 2012; Costa & Agostini, 2016; Ioannou & Serafeim, 2015; Jackson, Bartosch, Avetisyan, Kinderman & Knudsen, 2020).

After the approval of the NFRD, different events of great relevance were held, such as international agreements that, in 2015, led to the adoption of the 2030 Agenda and the 17 UN Sustainable Development Goals, as well as the Paris climate agreement.

In December 2019, the Commission presented the European Green Deal, a strategy for growth aimed at converting Europe into the first climate-neutral continent by 2050. In September 2020, the Commission presented its climate target plan for 2030, setting investments of approximately 350,000 million Euros more each year during the decade 2021−30 with regard to the earlier decade. The magnitude of the investment challenge is beyond the capacity of the public sector alone, so a fundamental role is also assumed by the financial sector, in order to meet those objectives (European Commission, n.d.).

In April 2021, after having identified several shortcomings in the implementation of the NFRD, as described above, the Commission adopted a proposal for a Corporate Sustainability Reporting Directive (CSRD), which would amend the existing reporting requirements of the NFRD. The proposed Directive implies a different approach with respect to the earlier directive, noticeable in its change of name: the expression "non-financial information" was substituted for "corporate sustainability", because the former appeared to imply that such information is of no financial relevance when its relevance is detailed in the Recitals of the proposal (CNMV, 2022). Among other novelties, draft European standards are envisaged in the proposal that the European Financial Reporting Advisory Group (EFRAG) would be expected to develop.

Three months later and in the framework of the European Green Deal, the Commission announced a new strategy for sustainable financing (European Commission, 2021). The new strategy placed greater emphasis on the role of sustainable financing (López-Jiménez & Zamarriego-Muñoz, 2021), proposing action in various areas and underlining the need for the financial system to be more resilient to the risks associated with climate change and environmental degradation.

However, despite the expectation invested in the financial sector, the challenge of how the sustainability performance of banks, as part of the financial sector, can be more comprehensively assessed to perform comparative analyses between different organizations across regions and over time periods is still a substantive issue (Avrampou, Skouloudis, Iliopoulos & Khan, 2019). Various authors have placed the focus on the sustainability of banks, insofar as it is an issue that has yet to be examined in detail in the literature (Cosma, Venturelli, Schwizer & Boscia, 2020; Gangi, Meles, D'Angelo & Daniele, 2019; Gallego-Sosa, Gutiérrez-Fernández, Fernández-Torres & Nevado-Gil, 2021; Izzo, Ciaburri & Tiscini, 2020; Miralles-Quirós, Miralles-Quirós & Redondo-Hernández, 2019; Santos & Rodrigues, 2021; Tsalis, Malamateniou, Koulouriotis & Nikolaou, 2020).

Yet, little is known about the real dissemination of SDGs and progress towards achieving these goals at the organizational level (Heras-Saizarbitoria, Urbieta & Boiral, 2022). Studies are scarce when we center on the integration of the SDGs within the disclosures of firms (Hummel & Szekely, 2022) including banks. Among the few that are found, we can highlight the work of Avrampou, Skouloudis, Iliopoulos and Khan (2019), in which five European banks were found to make low contributions to SDGs; the work of Zimmermann (2019), based on questionnaires administered to 26 German banks, which concluded that they had clearly neglected to assign the working time that they should have assigned to the SDGs; Cosma, Venturelli, Schwizer and Boscia (2020), whose work was centered on 262 European banks, showed that the country of origin, the legal system and the adoption of an integrated report appeared to differentiate the banks on the basis of their contribution to the SDGs; and Gallego-Sosa, Gutiérrez-Fernández, Fernández-Torres and Nevado-Gil (2021), who analyzed 30 European banking institutions, found that two-thirds of the European banks under study showed some commitment towards CSR when proposing to reach at least one of the SDGs. Despite these actions, no bank sought to monitor their contributions to all 17 SDGs.

Taking as a basis the scarce few studies on information disclosed on SDGs within the banking sector and the plurality of disclosure practices, and with the aim of increasing knowledge on these issues from the perspective of a country-level analysis, our investigation seeks, on the one hand, to analyze whether Directive 2014/95/EU and the Spanish Law have introduced homogeneity in the disclosure of non-financial information within that sector in Spain and, on the other, to evaluate their disclosure practice on SDGs.

With this second objective and, unlike most studies employing a content analysis of documents containing non-financial information and interviews (Korca & Costa, 2021), we sought to add quantitative considerations to qualitative analysis for a more accurate measurement of the effective contribution of banks to the SDGs. To do so, we applied Artificial Intelligence (AI) and, more specifically, Natural Language Processing (NLP) to identify mentions of each SDG, its goal, and its tags of interest in non-financial reports issued by banks. NLP has been gaining ground and is now a powerful text analysis tool (Fisher, Garnsey & Hughes, 2016; Lewis & Young, 2019). It could be useful to banks and, after the necessary adaptations, for all sorts of companies issuing non-financial reports. In addition to the above contribution, a ranking of the entities is created using a multi-criteria decision method.

Furthermore, to the best of our knowledge, the academic literature still lacks studies on the analysis of SDG disclosure through NLP, this paper representing one of the first within that area.

More specifically, we seek responses to the following research questions: (i) Is there a common reporting standard in the Non-Financial Information Reports (NFIRs) of the principal Spanish banks and in the way that they disclose information on the SDGs?; (ii) Towards which SDGs do Spanish banks orient their non-financial information activity?; (iii) Which words or tags included in the NFIRs are more related than any others with the SDGs?; (iv) What is the hierarchical position of each bank with respect to the disclosure of SDG-related information?

After this introductory section, we pay attention in the second section to the regulation of non-financial information in Europe and especially within Spain where our study was focused and we also analyze the quality of the NFIRs and the disclosure of the SDGs. The methodology used and how it is applied to the main Spanish banking entities, taking into account their total volume of assets, is described in the third section. The results are presented in the fourth section, and in the fifth and last section, the discussion, the main conclusions, and the limitations of the study.

## 2. Literature review

### 2.1. Mandatory disclosure of non-financial information in the EU and Spain

In 2014, just one year before the effective approval of the 2030 Agenda, an all-important milestone was reached in Europe with the approval of Directive 2014/95/EU of the European Parliament and the Council of 22 October 2014 (European Parliament and the Council, 2014) amending Directive 2013/34/EU regarding disclosure of non-financial information and diversity information by certain large undertakings and groups. In other words, it marked the change from voluntary to obligatory reporting and became a requirement for up to 6000 EU entities (European Parliamentary Research Service, 2021).

Under EU rules, Directive 2014/95/EU should have been transposed into the national legislation of the Member States by 6 December 2016, so that the first non-financial reports could have referred to the 2017 financial year. However, the Directive was transposed into Spanish law through Royal Decree-Law 18/2017 of 24 November 2017, almost one year after the stipulated deadline. Consequently, Spanish companies have only published their reports under the new EU requirements since 2018 (referring to the information available as of 31 December 2017) (García-Benau, Bollas-Araya & Sierra-García, 2022). The definitive transposition was published as Law 11/2018 of 28 December.

With regard to the firms that are obliged to engage in NFIR, whether individual or consolidated, the fundamental criterion is their size (a higher average number of employees than 500 −250 as from 2021−) and certain economic indicators of the company (total accounting entries of assets above 20 million Euros; net amount of the annual business turnover higher than 40 million Euros).

Moreover, the NFIR must include sufficient information to understand the development, the results, and the situation of the group, and the impact of its activities. At the very least, environmental and social issues and, likewise, human rights and the fight against corruption and bribery must appear in the report. So too must questions relating to employees, including measures that, if applicable, have been adopted to favor the principle of equal treatment and equal opportunities between both sexes, non-discrimination, the inclusion of people with disability, and universal accessibility.

With regard to the key indicators of non-financial results that are pertinent in relation to the specific business activity and that comply with the criteria of comparability, materiality, relevance, and reliability, "standards for key non-financial indicators that may generally be used and that comply with the Directives of the European Commission in this area and the standards of the Global Reporting Initiative will especially be used, having to make special mention of the national, European or international framework of each matter".

No reference to the 2030 Agenda can be found in Directive 2014/95/EU, for the aforementioned temporal reasons, although it is expressly mentioned in Law 11/2018: "Upon disclosure of this information, the firms that are so obliged will have to rely on national frameworks or European Union frameworks, being able to use the Eco-Management and Audit System (EMAS) adapted to our legal order through Royal Decree 239/2013, of 5 April, or on international frameworks such as the UN Global Compact, the UN Sustainable Development Goals, the Paris Agreement on climate change [...] or other recognized international frameworks".

With regard to research on the subject, the application of the Directive has been investigated in various studies. In their review of 78 studies spanning seven years (2014–2020), Korca and Costa (2021) discussed the current state of research on Directive 2014/95/EU and non-financial disclosures. The studies were classified by year of publication, country of analysis, main focus, methodology, organizational focus, and theoretical contributions, for their analysis, revealing four main avenues for future research.

More specifically, the investigation was fundamentally centered on two issues: a) the transposition of the Directive within EU member States, analyzing the degree of compliance, as well as the achievement of formal harmonization (Aureli, Magnaghi & Salvatori, 2019; García-Benau, Bollas-Araya & Sierra-García, 2022); and b) the degree of preparation of the firms to manage the recent regulations at a national level (Aureli, Salvatori & Magnaghi, 2020; Biondi, Dumay & Monciardini, 2020; Doni, Bianchi Martini, Corvino & Mazzoni, 2020; Dumitru, Dyduch, Guşe & Krasodomska, 2017; La Torre, Sabelfeld, Blomkvist, Tarquinio & Dumay, 2018; Venturelli, Caputo, Cosma, Leopizzi & Pizzi, 2017).

### 2.2. Quality of non-financial information disclosure

Over the same period of approval of Directive 2014/95/EU, the urgent need to increase and to improve both the quantity and the quality of disclosures of non-financial information was highlighted in various studies (Erkens, Paugam & Stolowy, 2015; Unerman & Chapman, 2014). Subsequently, Doni, Bianchi, Corvino and Mazzoni (2020) analyzed both the *ex ante* and *ex post* adoption of the European Directive in a sample of Italian firms. They concluded that the previous skills and competences in matters of non-financial reporting contributed in a significant way, especially to the description of the business model, although they expected that greater efforts might improve the quality of the non-financial reports. On the other hand, the results of the study by Agostini, Costa and Korca (2022) showed that the Directive affected the quantity of non-financial disclosures, yet their quality remained unaffected.

Bini, Dainelli and Giunta (2017) measured the impact of Directive 2003/51/EC while considering the degree of flexibility of European Directives and their impact on the quality of sustainability reporting. They concluded that an obligatory intervention with hardly a strict level of specification was associated with an increase in the practice of disclosures. However, they also mentioned that it was questionable whether such an increase had substantially led to high-quality disclosures when the non-financial indicators were still being ignored. In turn, the work of Luque-Vílchez and Larrinaga (2016) explored the attempt to regulate corporate social responsibility information for Spanish firms through Law 2/2011, of 4 of March, on the Sustainable Economy —a Law that was relevant for Directive 2014/95/EU on non-financial information, because the preparatory EU documents cited the Spanish regulation as a precedent— which had limited consequences, due to the very modest increase in the quality

of the sustainability reports, possibly explained by the reduction in the number of reports.

La Torre, Sabelfeld, Blomkvist, Tarquinio and Dumay (2018) expressed similar ideas along the same lines when they declared that regulating Non-Financial Information will not always mean better reporting or improvements to corporate accountability. Likewise, Haller, Link and Groß (2017) when they mentioned that the need to confront the challenge of sustainability hardly appeared to have led to greater commitment with an effective change in the model of non-financial disclosures. In addition, evidence from various investigations on the sustainability disclosure practices of firms was heterogeneous, varying between countries and firms (Brooks & Oikonomou, 2018; Buallay, 2019; Erkens, Paugam & Stolowy, 2015; Huang & Watson, 2015; Qureshi, Kirkerud, Theresa & Ahsan, 2020; Stolowy & Paugam, 2018; Tamimi & Sebastianelli, 2017).

In contrast, Perrault Crawford and Clark Williams (2010) studied countries with and without regulation. They found greater disclosure quality in France where regulation prevailed compared with the USA where there was no regulation. The results of Caputo, Leopizzi, Pizzi and Milone (2020) confirmed the existence of some factors that impacted positively on the quality of the non-financial declarations prepared in accordance with Directive 2014/95/EU.

### 2.3. Sustainable development goals (SDGs): background and reporting

The proliferation of global economic, social, and environmental challenges in tandem with political instability have created a dynamic of unsustainable changes over the past few decades (Sepasi, Rahdari & Rexhepi, 2018).

The well-known "Brundtland Report" (World Commission on Environment and Development, 1987), published in 1987, marked the changing trend, defining sustainable development as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Since then, the 2030 Agenda has almost literally adopted the same tenor and various United Nations (UN) conferences and summits have been organized to establish a reasonable basis for sustainable development, among which we may highlight the UN Conference on Environment and Development (1992), the Millennium Summit (2000), and the International Conference on Financing for Development (2015).

The eight Millennium Development Goals (MDGs) emerged from the UN Millennium Summit (United Nations, n.d.), with a view to reaching certain goals of interest to all humanity, taking 2015 as a temporal limit for their achievement. After reaching the target date of the MDGs, the UN General Assembly Resolution of 25 September 2015 was approved, some months before the Paris Agreement on Climate Change of 12 December 2015, with the title "Transforming Our World: the 2030 Agenda for Sustainable Development" (United Nations, 2015), which included the 17 Sustainable Development Goals (SDGs) and their 169 Targets, described as the "New universal agenda", under the motto "No one will be left behind".

The SDGs therefore incorporated the MDGs, aspiring to achieve, during the period between 1 January 2016 (date of its entry into force) and 2030, what the latter goals never achieved. The SDGs and their targets were therefore advanced to seek an integrated response to what are known as the three dimensions -economic, social, and environmental- of sustainable development.

One of the most interesting aspects of the 2030 Agenda is that the signatory States expressly recognized the role that the various participants from the private sector were to play in the implementation of the new Agenda, from micro-enterprises and cooperatives up to multi-nationals, and the function of civil-society and philanthropic organizations (United Nations, 2015). However, it is important to note that the SDGs are not binding under international or national law. In addition, many of the goals and targets are generalist and of a qualitative nature. Consequently, governments and firms can exercise discretion over the specific implementations of their respective goals (Biermann, Kanie & Kim, 2017).

In contrast to the extensive research on both financial and non-financial disclosures, due to the novelty of SDG reporting, there has been little research on SDGs and their integration in the disclosures of firms (Hummel & Szekely, 2022). Besides, there is a lack of homogeneity due to the absence of specific SDG reporting standards (Pizzi, Rosati & Venturelli, 2021). While there was a first attempt to represent the contributions of companies to the SDGs through non-financial indicators, called the SDG Compass, a joint initiative of the GRI, the UN and the WBCSD (GRI, the UN Global Compact & the World Business Council for Sustainable Development (WBCSD), 2015), not all companies apply it, as it was primarily developed for large multinational enterprises. Subsequently, the WBCSD (2020) also produced the SDG Essentials for Business, a learning suite for corporate SDG activities.

Small and Medium Enterprises (SMEs) and other organizations are also encouraged to use the guides as a source of inspiration and to adapt them as necessary. However, the work of Elalfy, Weber and Geobey (2021) found that larger organizations are more likely to integrate the SDGs into their reporting than smaller organizations. The proportion of multinational firms that mention the SDGS in their sustainability reports continues to be limited (23% of sample companies and 39% of sample companies that publish a sustainability report), whereas the nature of SDG-related disclosures appears to be drafted in positive and symbolic rather than measurable and substantive terms (van der Waal & Thijssens, 2020), all of which despite the SDGs having been converted into a general reference with which to measure the efforts of firms in matters relating to ESG (Chen, Mussalli, Amel-Zadeh & Weinberg, 2022). In the case of Spain, the country in which the entities in this study are found, only 36% of firms have implemented a corporate strategy in response to the 2030 Agenda (Diaz-Sarachaga, 2021).

In any case, sustainability reporting has been identified as an enabler of SDG actions, investments and strategies (Rosati & Faria, 2019a) and the GRI has been indicated as a useful framework for the operationalization of the SDGs (Diaz-Sarachaga, 2021; Ordonez-Ponce & Khare, 2021).

In the academic field, most articles have addressed the contribution of business to the SDGs. Gusmão Caiado, Leal Filho, Quelhas, Luiz de Mattos Nascimento and Ávila (2018); Mio, Fasan, Marcon and Panfilo (2020) and Bennich, Weitz and Carlsen (2020), for example, all produced literature reviews and highlighted the lack of detailed information on how organizations engage with SDGs. In the case of Mio, Fasan, Marcon and Panfilo (2020), the final sample consisted of 101 papers published between 2015 and 2020, of which 53 were in the area of Business Management and Accounting, an area in which the issue has been debated more than any other. First in generic terms and then with an intensified focus on the field of "Strategy and Management". Of the total sample, only 3 articles were focused on the banking sector. Moreover, the percentage of papers that analyzed SDG disclosures and SDG relevance, the aspects addressed in this study, were ranked second and third to last among all the issues that they addressed.

Nevertheless, the scholarly literature based on empirical studies is at a very early and underdeveloped stage. Practitioners and scholars have highlighted the lack of knowledge on the specific role of organizations in addressing SDGs and the real impact of this initiative on their practice (Heras-Saizarbitoria, Urbieta & Boiral, 2022). The few empirical studies found on SDG disclosure (García-Sánchez, Rodríguez-Ariza, Aibar-Guzmán & Aibar-Guzmán, 2020; Gunawan, Permatasari & Tilt, 2020; Rosati & Faria, 2019a, 2019b) assessed it on a very rough basis and had temporal and regional limitations. In contrast to the previous ones, the work of Hummel and Szekely (2022) is among the first to provide large-scale (652 reports with information on SDGs) and in-depth empirical evidence on the state of SDG disclosure among

European firms. Their results showed a substantial increase in SDG reporting quality over time, but a distinct absence of disclosures of quantitative and forward-looking information. Likewise, the work of Heras-Saizarbitoria, Urbieta and Boiral (2022) examined the engagement strategies towards SDGs of 1370 organizations from 97 countries, taking data from their sustainability reports. Their findings pointed to a superficial engagement with the SDGs for the vast majority of organizations, which suggests a process of "SDG-washing".

Alongside the Academy, a number of consultancies and institutions have also addressed the contribution of business to each SDG (EY, 2020; GRI & AG Sustentable, 2021; KPMG, 2020; PWC, 2019; SDG Observatory, 2020; UN Global Compact & DNV GL, 2020; UN Global Compact. Network Spain, 2020a, 2020b).

Finally, interest in the application of Artificial Intelligence – and especially Machine Learning – to the field of Sustainable Development (SD) has been increasing over recent years. However, up until now, NLP has not yet been applied to the field of SD in a systematic and academically rigorous manner (Conforti, Hirmer, Morgan, Basaldella & Or, 2020). Among the few works that have centered on SDGs, there is the work of Smith, Vacca, Mantegazza and Capua (2021) and then Hummel and Szekely (2022), who employed NLP together with content analysis to assess three types of SDG disclosures. The first study, rather than centered on firms, was centered on measuring overlaps in international policy discourse on SDGs, as represented by the corpus of all existing UN progress reports around each goal (85 reports).

## 3. Methodology

The phases followed to carry out the objectives are described below.

### 3.1. Sample

The study is centered on Spanish funding entities. The list of credit entities supervised by the European Central Bank (ECB) as of 1st December 2020 was taken as a reference for the selection of the sample (European Central Bank, 2020). In particular, 12 banking entities were selected from among the 115 significant banks directly supervised by the ECB, among other reasons, due to their consolidated assets amounting to over 30,000 million Euros (Table 1).

### 3.2. Data collection

The data were gathered from the corporative websites of the 12 entities forming the sample. Specifically, the Non-Financial Information Reports for the 2020 Financial Year were located and downloaded or, if unavailable, the Management Reports, Sustainability Reports, CSR Reports, *etc*. that contained non-financial information. As it was unclear whether the SDG-related documents and data posted on the corporate and the commercial websites of the above entities had been approved and published in accordance with the same criteria established for the management reports, neither were given any consideration. Nor were the NFIRs from 2018 to 2019, the two first years of application of Law 11/2018, because of highly varied reporting and difficulties over their comparison (EY, 2020).

A document with non-financial information had to be compiled for both CaixaBank and Ibercaja, as no separate documents other than the management report were available from those entities, nor was the part corresponding to their NFIRs expressly indicated in their Management Reports. In doing so, the sections of Law 11/2018 on non-financial information and diversity were taken as a reference and the information linked to those sections was sourced from the pages of the consolidated Management Reports.

### 3.3. Data analysis

According to Evangelinos, Skouloudis, Nikolaou and Filho (2009), the approaches towards evaluating the content of sustainability reports can be grouped into three general categories: content analysis methods, survey-based questionnaires, and evaluations with scoring schemes.

In our case, we used the first and third category, developing a three-part analysis.

In the first place, the content of the documents that contained non-financial information was analyzed manually, taking as a reference for their comparison the recommendations of both the Spanish National Securities Market Commission (CNMV, 2021) and the European Securities and Markets Authority (2020).

In particular, the following aspects or sustainability reporting quality indicators, in line with those used by Mion and Loza (2019), were studied: publication, whether separate or otherwise, of the Annual Report; document title; electronic format of publication; disclosure standard; option to prepare the report; other models and guides for information; independent verification; adherence to principles and initiatives; presence of content indexes (*i.e*., indexed references to legislation, GRI, SASB, SDGs, *etc*.); explicit reference to at least one SDG in the indexes; preparation of NFIR in accordance with recommendations; and SDGs to which they contribute.

In second place, Natural Language Processing (NLP) was applied to 12 documents. NLP is a branch of AI that enables computers to mine and to manipulate relevant information from the texts that are

**Table 1**
List of significant Spanish credit entities.

| Name | Ticker* | Grounds for significance |
|---|---|---|
| Abanca Corporación Bancaria, S.A. | ABA | Size (total assets EUR 50–75 bn) |
| Banco Bilbao Vizcaya Argentaria, S.A. | BBVA | Size (total assets EUR 500–1000 bn) |
| Banco de Crédito Social Cooperativo, S.A. (Grupo Cajamar) | CMAR | Size (total assets EUR 30–50 bn) |
| Banco Sabadell, S.A. | SAB | Size (total assets EUR 150–300 bn) |
| Banco Santander, S.A. | SAN | Size (total assets above EUR 1000 bn) |
| Bankinter, S.A. | BKT | Size (total assets EUR 75–100 bn) |
| BFA Tenedora de Acciones S.A.U. (Bankia, S.A.) | BKIA | Size (total assets EUR 150–300 bn) |
| CaixaBank, S.A. | CABK | Size (total assets EUR 300–500 bn) |
| Ibercaja Banco, S.A. | IBER | Size (total assets EUR 30–50 bn) |
| Kutxabank, S.A. | KUX | Size (total assets EUR 50–75 bn) |
| Liberbank, S.A. | LBK | Size (total assets EUR 30–50 bn) |
| Unicaja Banco, S.A. | UNI | Size (total assets EUR 50–75 bn) |

Source: entities listed with the European Central Bank (2020) and the Madrid Stock Exchange (2021). Authors' own work.

* Abanca Corporación Bancaria, Grupo Cajamar, Ibercaja Banco and Kutxabank have no Ticker Codes on the Madrid Stock Exchange, for which reason the codes were assigned by the researchers.

processed, so that the results of human language may be understood and interpreted, especially in terms of word patterns (Liddy, 2001).

In particular, *Escáner2030*, an open access software package, was used. This tool was developed by Political Watch (2021), an independent organization belonging to the Foundation Salvador Soler, in collaboration with the Secretary of State for International Cooperation of the Ministry of Foreign Affairs, the EU and Cooperation of the Government of Spain, and Actua Innovació, a technological and knowledge hub of the Principality of Andorra.

Before the application of *Escáner2030*, all the documents and the verification reports had their content indexes removed, so that no tags were duplicated that might be of interest in the analysis.

*Escáner2030* is based on a mass labeling system of text content in almost any format (.pdf, .txt, .doc. .docx, .odt, .xls, .ppt, .pptx, .jpg, .png, .gif, .html). It incorporates a knowledge base or taxonomy of over 4000 tags related with 2030 Agenda and the SDGs (17 Goals and 169 Targets). For the preparation of the taxonomy, its creators consulted UN documents related with the topic (documents from the General Assembly and from different UN Agencies, as well as the UN system of goal and target indicators). They also consulted official Spanish sources (governmental plans, legislation), technical documentation (from expert organizations, from academia, *etc.*), and the parliamentary activity of the Spanish Parliament related with the material. Finally, the complete taxonomic system was shared for consultation with expert public and private organizations and civil society for its validation and enrichment. The taxonomy finally covered a broad set of language patterns represented through regular expressions, which means the software was finely programmed for text recognition of entities and complex concepts.

With the SDG-based taxonomy in Spanish, all the sentences of the text for analysis were scanned by *Escáner2030* that also counted and totaled the number of tags found in each sentence. As each tag in the taxonomy was linked to its corresponding SDG, the final results from Escáner2030 are shown in a structured format on a Microsoft Excel spreadsheet of all the SDGs and targets that are mentioned in the text, as well as a series of interactive web visualizations. Finally, we grouped the 12 spreadsheets in a single sheet, thereby generating a dynamic table on which the disclosures of each entity with respect to each SDG could be reviewed.

Given that the NFIRs are drafted for individual reading in business contexts, certain numerical information is usually presented in the form of graphs and infographics. This representation, although visually attractive and at times easier to understand, is difficult to transform into a cohesive extract that can subsequently be machine processed (Moreno & Caminero, 2020). The software tool was therefore never used to analyze the graphic information.

In third place, we considered the 12 entities as alternatives and the 17 SDGs as criteria, so as to obtain a valuation and a hierarchy of the financial entities as a function of the SDGs, and we then computed the weights associated with each SDG.

Throughout the literature, four central approaches for the design of weights (Lafortune, Fuller, Moreno, Schmidt-Traub & Kroll, 2018) have been identified: a) Equal weights; b) Mathematical weights; c) Expert weights; and d) Subjective/flexible weights. In our work, we decided upon approximations of subjective weights. In concrete, we established various sets of weights, with which different scenarios were envisaged. In the first place, we calculated as a weight associated with each SDG, the coefficient between the total number of tags found in all the financial entities for each SDG and the total number of tags found for all the SDGs. We took the reports from consultants and institutes as a reference, to obtain the other sets of weights that were based on the number or percentage of firms that contributed to each SDG (Table 2). In this way, for each report that was identified, we computed the weight associated with each SDG, normalizing the percentage of firms that contributed to it as a ratio of all the firms.

We then applied the multicriteria TOPSIS decision method, a methodology first developed by Hwang and Yoon (1981), to each set of weights. This method has important advantages when compared with other multi-criteria decision-making techniques, such as Analytic Hierarchy Process (AHP) and ELECTRE (Govindan, Khodaverdi & Jafarian, 2013), among which we may highlight the following: 1) It is especially useful when dealing with a large number of alternatives and criteria; 2) Explicit trade-offs and interactions between attributes are possible; 3) Preferential ranking of alternatives with a numerical value that provides a better understanding of differences and similarities between alternatives, whereas other Multiple Attribute Decision Making (MADM) techniques, such as the ELECTRE methods, only determine the rank of each alternative; 4) Pairwise comparisons, required by methods such as the AHP, are avoided; 5) It is a relatively simple computational process with a systematic procedure; and 6) According to the simulation comparison from Zanakis, Solomon, Wishart and Dublish (1998), TOPSIS has the fewest rank reversals when an alternative from among the MADM methods is either added or removed.

The working principle of TOPSIS is based on the fact that the chosen alternative must be the closest to the Positive Ideal Solution (PIS) and the furthest away from the Negative Ideal Solution (NIS). The PIS maximizes the benefit criteria and minimizes the cost criteria, whereas the NIS maximizes the cost criteria and minimizes the benefit criteria. The method produces a performance score that lies between 0 and 1, and the alternatives can be ranked from the best to the worst using these scores. TOPSIS has been used in the banking sector, among other aspects, to evaluate financial results (Oral, 2016), to analyze financial

**Table 2**
Reports from consultants and institutes, and research papers that mention the contribution of the firms to each SDG.

| Reference | Sample of firms | Area | Short name |
|---|---|---|---|
| Cosma et al. (2020) | 223 | European (22 countries) (Banking sector) | COSMA |
| EY (2020) | 35 | Spain | EY IBEX 35 |
| KPMG (2020) | 5200 | Global (52 countries) | KPMG N100 |
| PWC (2019) | 1141 | Global (31 countries) | PWC GLOBAL |
| PWC (2019) | 37 | Spain | PWC SP |
| UN Global Compact and DNV GL (2020) | 5% of UN Global Compact Signatories | Global | UN GC |
| UN Global Compact. Network Spain (2020a) | 1407 | Spain | UN GC SP |
| UN Global Compact. Network Spain (2020b) | 268 | Spain (GC Signatories) | UN GC SIG SP |
| UN Global Compact. Network Spain (2020b) | 35 | Spain | UN GC SP IBEX 35 |
| GRI and AG Sustentable (2021) | 90 | Latin America (5 countries) | GRI LATAM |
| SDG Observatory (2020) | 137 | Spain | SDG OB SP |
| SDG Observatory (2020) | 19 | Spain (Financial sector) | SDG OB FI |

**Table 3**
Decision matrix.

| | $w_1$ | $w_2$ | ... | $w_{17}$ |
|---|---|---|---|---|
| | $C_1$ | $C_2$ | ... | $C_{17}$ |
| $A_1$ | $x_{1\,1}$ | $x_{1\,2}$ | ... | $x_{1\,17}$ |
| $A_2$ | $x_{2\,1}$ | $x_{2\,2}$ | ... | $x_{2\,17}$ |
| | ... | ... | ... | ... |
| $A_{12}$ | $x_{12\,1}$ | $x_{12\,2}$ | ... | $x_{12\,17}$ |

parameters (Mandic, Delibasic, Knezevic & Benkovic, 2014), and to measure sustainability (Aras, Tezcan, Furtuna & Kazak, 2017).

The steps followed in our study to apply the TOPSIS method were as follows:

a) Construction of the decision matrix.

Each of the 12 financial entities or alternatives ($A_i$, i = 1, 2, ..., 12) was evaluated with respect to each of the 17 SDGs or criteria ($C_j$ ,j = 1, 2, ..., 17), in such a way that each element, $x_{ij}$, in Table 3 represented the number of tags of interest of the financial entity, $A_i$, associated with each SDG, $C_j$, for which the associated weight was $w_j$.

b) Normalization of the decision matrix. Each element of the normalized matrix was constructed using the expression:

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}},\ i = 1, \ldots, 12; j = 1, \ldots, 17$$

c) Construction of the normalized weighted decision matrix. The elements of the normalized weighted decision matrix, V, were obtained through the expression:

$$v_{ij} = w_j n_{ij},\ i = 1, \ldots, 12; j = 1, \ldots, 17$$

where $w_j$ represents the weight associated with each criterion.

d) Obtaining the PIS and the NIS. Taking into account that all the SDGs are benefit criteria, the ideal positive and negative solutions ($A^+$ y $A^-$) were, respectively, obtained with the following expressions:

$$A^+ = \{v_1^+,\ v_2^+, \ldots, v_{17}^+\} = \left\{\left(\max_i v_{ij},\ j = 1, \ldots, 17\right)\right\}$$

$$A^- = \{v_1^-,\ v_2^-, \ldots, v_{17}^-\} = \left\{\left(\min_i v_{ij},\ j = 1, \ldots, 17\right)\right\}$$

e) Calculation of the distance measurements. The distances of each alternative to the PIS, $A^+$, and to the NIS, $A^-$, were respectively calculated with:

$$d_i^+ = \sqrt{\sum_{j=1}^{17} \left(v_{ij} - v_j^+\right)^2},\ i = 1, \ldots, 12$$

$$d_i^- = \sqrt{\sum_{j=1}^{17} \left(v_{ij} - v_j^-\right)^2},\ i = 1, \ldots, 12$$

f) Calculation of the closeness coefficient. The closeness coefficient, $R_i$ ($0 \le R_i \le 1$), of each financial entity was obtained through the expression:

$$R_i = \frac{d_i^-}{d_i^+ + d_i^-},\ i = 1, \ldots, 12$$

With the results, the financial entities could be placed in descending order as a function of $R_i$ . In this way, the closer the value of $R_i$ to 1, the greater the proximity to the ideal and the higher the priority.

## 4. Results

Our analysis of the NFIRs of the 12 Spanish banking entities led to different results depending on the chosen methodology: starting with the description of the results linked to manual revision, followed by the NLP results, and ending with the results of the TOPSIS mathematical methodology.

### *4.1. Characteristics and presentation of the documents with non-financial information*

According to Law 11/2018, NFIR should be incorporated in the management report of the firm or published as a separate report, expressly indicating that it forms part of the management report, and is subject to the same approval, registration, and publication criteria as the management report. As may be appreciated in Table 4, 75% of the public entities treated their NFIR as separate documents either in .pdf format (58.33%) or in HTML (16.67%), whereas the rest included it (in .pdf format) in the management report.

There was no one title for the documents that had been separately published, although titles that contained the terms “Non-financial information report” stood out (77.7%).

### *4.2. Reporting frameworks, external verification and content indexing*

100% of the financial entities under analysis drafted the NFIR following the criteria of the GRI reporting framework of the Global Reporting Initiative. In addition, 50% of them used the sector supplement for financial services from the GRI-G4 Guide.

**Table 4**
Modality and format of the NFIR.

| Entity | NFIR as a separate document | Document title | Electronic format | Link |
|---|---|---|---|---|
| ABA | ✓ | Corporate Social Responsibility Report 2020 | .pdf | https://t.ly/IzIY |
| BKIA | ✓ | Non-Financial Information Report 2020 | .pdf | https://t.ly/rxXT |
| BKT | ✓ | Consolidated Non-Financial Information Report 2020 | .pdf | https://t.ly/LsOt |
| BBVA | ✓ | Non-Financial Information Report | .html | https://t.ly/afOJ |
| CABK | | Consolidated Management Report 2020 | .pdf | https://t.ly/LRFw |
| CMAR | ✓ | Sustainability Report 2020. Consolidated Non-Financial Information Report | .pdf | https://t.ly/vbAj |
| IBER | | Consolidated Management Report 2020 | .pdf | https://t.ly/qaGP |
| KUX | ✓ | Sustainability Report 2020 | .html | https://t.ly/UZWN |
| LBK | ✓ | Non-Financial Information Report 2020 | .pdf | https://t.ly/p4hq |
| SAB | ✓ | Non-Financial Information Report 2020 | .pdf | https://t.ly/NY6D |
| SAN | | Responsable Banking. Consolidated Non-Financial Banking 2020 | .pdf | https://t.ly/ffJF |
| UNI | ✓ | Consolidated Non-Financial Information 2020 | .pdf | https://t.ly/8R5N |

**Table 5**
Framework of principal report, sector supplement, and independent verification.

| Entity | Standard (option) | Sector supplement Financial Services (GRI-G4) | Independently verified | Information that is verified | Additional information |
|---|---|---|---|---|---|
| ABA | GRI (Comprehensive) | ✓ | KPMG | • Global Reporting Initiative (GRI) Content indexes<br>• Content indexes required by Law 11/2018 | ✓ |
| BKIA | GRI (Comprehensive) | | KPMG | • Annex I. Content indexes Law 11/2018, of 28 December<br>• Annex II. Content indexes GRI Standards | ✓ |
| BKT | GRI (Comprehensive) | ✓ | PWC | • Requirements of Law 11/2018 in matters of non-financial information and diversity•<br>GRI index 2020 | ✓ |
| BBVA | GRI (Comprehensive) | | KPMG | Undisclosed | Undisclosed |
| CABK | GRI (Comprehensive) | | PWC | • Content indexes Law 11/2018, of 28 December<br>• GRI content indexes | ✓ |
| CMAR | GRI (Comprehensive) | ✓ | KPMG | • Correspondences between the Law 11/2018 of non-financial information and GRI<br>• Annex I GRI Content indexes<br>• Annex II Index of report on the UNEP FI Principles for Responsibility Banking Reporting | ✓ |
| IBER | GRI (Core) | ✓ | PWC | • Requirements of Law 11/2018 on matters of non-financial information and diversity<br>• GRI Content indexes | ✓ |
| KUX | GRI (Comprehensive) | | AENOR | Undisclosed | Undisclosed |
| LBK | GRI (Not mentioned) | | EUDITA | • GRI Index | ✓ |
| SAB | GRI (Not mentioned) | | KPMG | • Content indexes Law 11/2018 | ✓ |
| SAN | GRI (Comprehensive) | ✓ | PWC | • Content indexes Law 11/2018 of non-financial information<br>• GRI Content indexes | ✓ |
| UNI | GRI (Core) | ✓ | PWC | • GRI Index and information required by Law 11/2018, of 28 December, linked to the GRI standards. | ✓ |

From the two options to prepare reports in accordance with the GRI standards, 66.66% of the entities selected the Comprehensive option, 16.66% the Core option, and the remaining 16.66% (Liberbank and Sabadell) offered no information on the option that was employed (Table 5). It must be said that, although the choice of one or another option was neither related with the quality of the information in the report nor to the impact and scope of the organization, the majority of entities opted for the Comprehensive option, one that required additional content on strategy, ethics, and integrity of the organization, and its governance.

Only Kutxabank and Liberbank engaged independent verification service providers (AENOR and EUDITA, respectively) for their NFIRs that were neither KPMG (41.66%) nor PWC (41.66%). The information for verification was centered on the requirements of Law 11/2018 and the GRI standards, with the exception of the Cajamar report that, in addition, included indexed references to the UNEP FI Principles for Responsible Banking. Although the verification reports mentioned that additional non-financial information was available, it was on no occasion subject to verification.

Two entities (BBVA and Kutxabank) must be highlighted that disclosed no particular information on verification. The exact information that was subject to verification was never mentioned in the BBVA audit report. In contrast, Kutxabank only showed a certificate, but not the verification report, for which reason not only was it impossible to ascertain the information that had been verified, but also the existence of additional unverified information, and, moreover, any exceptions that it might have contained.

A total of 13 modalities were identified in the content indexes of the NFIRs, in which different reporting frameworks were included (Table 6). Cajamar with 6 and Santander with 5 stood out, whereas Liberbank only published 1.

Compliance with Law 11/2018 was through three different formats, according to the contents of the reports, they were linked to: a) the corresponding GRI number [row 1]; b) the GRI title and number [row 2]; or 3) the GRI number and the Principles of the Global Compact [row 4]. We must highlight that the only bank to use the last-mentioned modality was Liberbank, while from among the 11 remaining entities, 72.73% chose the first [row 1] and 27.27% the second [row 2]. All the entities that opted for the first modality, except one, showed an additional table with the GRI indexes [row 3]. The case of Abanca was special, given that it linked the GRI standards with the Principles of the Global Compact and the SDGs [row 5]. Three entities presented additional content indexes of thematic or basic or specific GRI-related content [rows 6 and 7].

With reference to other reporting frameworks, 75% of the entities reported them in additional tables (UNEP FI Principles for Responsible Banking; the standards of the Sustainability Accounting Standards Board (SASB); the International Integrated Reporting Council (IIRC) framework; and the UN Global Compact Principles, among others) [rows 8 to 13]. The fact that 58.33% of the entities referred to a content index on the UNEP FI Principles for Responsible Banking stands out. Only two entities, Abanca and Cajamar, incorporated the SDGs within the content indexes [rows 5 and 12].

### 4.3. Compliance with Law 11/2018 and application of recommendations

All the banking entities identified the contents of the Law and referred to their location in the document and the framework that was used. However, it is of interest that only 33.33% (Abanca, BBVA, Cajamar and Unicaja Banco) linked the contents of the Law to specific pages of the NFIR, in accordance with the recommendations of the European Securities and Markets Authority (2020).

### 4.4. SDGs on what they contributed

In the Recitals of Law 11/2018 in Section 1, it is established that in order to facilitate non-financial information and information on diversity, firms can base their reporting on international frameworks such as the UN SDGs.

In this sense, 100% of the banks released information on their priority SDGs or on those where their activity had a greater capability for influence (Table 7). The two entities that reported the largest and

**Table 6**
Content indexes included in the NFIR.

| CONTENT INDEXES | ABA | BKIA | BKT | BBVA | CABK | CMAR | IBER | KUX | LBK | SAB | SAN | UNI | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1] Law 11/2018 linked to GRI (GRI indicator number) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | 8 |
| [2] Law 11/2018 and GRI (with GRI title and indicator number GRI) | | | | | | | | ✓ | | ✓ | | ✓ | 3 |
| [3] GRI Content indexes | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | 7 |
| [4] Law 11/2018 with link to GRI (GRI indicator number) and to the Global Compact Principles | | | | | | | | | ✓ | | | | 1 |
| [5] GRI content indexes with link to Global Compact principles and SDGs | ✓ | | | | | | | | | | | | 1 |
| [6] GRI thematic contents | | | ✓ | | | | | | | | ✓ | | 2 |
| [7] GRI basic specific contents | | | | ✓ | | | | | | | | | 1 |
| [8] UNEP FI Principles for Responsible Banking | ✓ | | | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | 7 |
| [9] IIRC content requirements | | | | | | ✓ | | | | | | | 1 |
| [10] Global Compact Principles | | | | | | | | ✓ | | | | ✓ | 2 |
| [11] Global Compact Principles with links to GRI | | | | | | ✓ | ✓ | | | | | | 2 |
| [12] SDGs and GRI | | | | | | ✓ | | | | | | | 1 |
| [13] SASB Content indexes | | | | | | | | | | | ✓ | | 1 |
| TOTAL | 3 | 2 | 3 | 4 | 3 | 6 | 4 | 2 | 1 | 2 | 5 | 2 | |

the smallest number of priority SDGs were Unicaja Banco (12) and CaixaBank (4), respectively, although the latter pointed out that its four priority SDGs were interrelated with the other SDGs and that contributed to all of them thanks to their transversal nature. In addition, 50% of the financial entities also reported secondary and complementary SDGs. On average, each entity reported 9.83 of the 17 SDGs.

It must be pointed out that SDG 8 (Decent work and economic growth) was the only one that all entities considered a priority. All entities made mention of Quality Education (SDG 4) and Climate Action (SDG 13), although they were not considered priorities on all occasions. The SDGs that obtained fewer measures for action were SDG 2 and SDG 14.

### 4.5. Natural language processing applied to the NFIR

After applying the *Escáner2030* online software tool to the 12 NFIRs, a total of 7490 tags of interest related with the SDGs were obtained. Table 8 shows all the tags that the tool assigned to each SDG and entity. The maximum number of tags, 1427, was assigned to SDG 13, followed by SDG 8 with 1141 tags. With regard to the entities, it was Santander that presented the highest number of tags at 869, leaving the last one, Liberbank, with 322.

Among the 4000 tags that the software tool detected, the five tags that obtained the highest frequency by entity are shown in Table 9. As can be observed, 50% of the entities placed the tag of Climate change in first place; moreover tags 2 and 3 presented very similar patterns.

The word clouds with the 25 most frequent tags of each entity were also prepared, taking into account their importance, as well as the colour that the UN assigned to the SDG (Illustration 1). We can see that Kutxabank and Liberbank may be highlighted for not having placed climate change among the most relevant tags.

### 4.6. Ranking of entities by SDG-related disclosures

The normalized matrix was computed from the decision matrix shown in Table 8. Subsequently, taking into account the number of tags of interest found for each SDG within each entity (E2030 Tags), and likewise within the consultancy reports, entities, and investigators, 13 sets of weights and, in consequence, 13 different scenarios were obtained (Table 10). The respective normalized weighted decision matrix was obtained for each one.

The weights also gave insight into the distribution of the three dimensions of sustainable development: economic (SDGs 8, 9, 10, 12, and 17), social (SDGs 1, 2, 3, 4, 5, and 16), and environmental (SDGs 6, 7, 11, 13, 14, and 15). According to the data from our study (E2030 Tags), the entities under analysis attributed most weight (36.54%) to the economic dimension, and then to the environmental (34.61%), and then to the social (28.85%) dimensions.

After determining the ideal positive and negative solution and having computed the distance measurements, the closeness coefficient, $R_j$, was obtained for each of the entities in each of the 13 proposed scenarios (Table 11). This coefficient was used to rank the financial entities in accordance with the way that they disclosed information on the SDGs in their NFIRs. Santander was the first in all the scenarios and Liberbank was the last. Together with Santander, Bankia always appeared in second place, except in scenario 1. BBVA also occupied third place on most occasions. Sabadell and Ibercaja were invariably alongside Liberbank at the end of the list.

## 5. Discussion and conclusions

Non-financial information is essential for building trust in society by responding to the expectations and needs of society and for communicating with external stakeholders, including investors, regarding medium- and long-term value creation (PWC, 2021).

NFIR has been mandatory in Spain since the entry into force of Royal Decree-Law 18/2017, which contains the obligatory provisions of Directive 2014/95/EU, on the disclosure of non-financial information and information on diversity by certain large firms and groups. Subsequently, Law 11/2018, published on 29 December 2018, widened its scope and content for the financial years beginning from 1 January 2018. In this way, the companies that fulfilled certain requirements had a brief interval within which to prepare their NFIRs following the end of the financial year. The brief interval, together with the flexibility of the Law, meant that the first reports were highly varied in the first year. In 2019, reporting differences were reduced, above all in the calculation method of the non-financial indicators. In 2020, challenges continued to arise, among which may be highlighted the aims of reducing diversity in the reporting formats, improving performance in key social and environmental aspects, and progressively equipping the control and supervision mechanisms of non-financial information in the hands of the Board of Directors (EY, 2020).

Our study was centered on a comparative analysis of the NFIRs of 12 Spanish financial entities, over the financial year 2020, with the dual objectives of, firstly, analyzing whether their disclosures of non-financial information reflected greater homogeneity since Directive 2014/95/EU and its transposition into Spanish Law and, secondly, of assessing their disclosure practices on the SDGs using natural language processing.

**Table 7**
Measures for action on all 17 SDGs for each of the 12 banking entities.

| SDG | ABA | BKIA | BKT | BBVA | CABK | CMAR | IBER | KUX | LBK | SAB | SAN | UNI | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. No poverty | | | | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | | 6 |
| 2. Zero hunger | | | | | ✓ | ✓ | | | | | | | 2 |
| 3. Good health and well-being | ✓ | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | 8 |
| 4. Quality Education | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 12 |
| 5. Gender Equality | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| 6. Clean water and sanitation | | | | | ✓ | ✓ | | | | ✓ | | | 3 |
| 7. Affordable and clean energy | ✓ | ✓ | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | 8 |
| 8. Decent work and economic growth | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 12 |
| 9. Industry, innovation and infrastructure | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | | ✓ | | ✓ | 8 |
| 10. Reduced inequalities | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | 10 |
| 11. Sustainable cities and communities | | ✓ | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | 7 |
| 12. Responsible consumption and production | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | 8 |
| 13. Climate action | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 12 |
| 14. Life below water | ✓ | | | | ✓ | | | | | | | | 2 |
| 15. Life on land | ✓ | | | | ✓ | ✓ | | ✓ | | | | | 4 |
| 16. Peace, justice and strong institutions | | | | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | 6 |
| 17. Partnerships for the goals | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 10 |
| TOTAL | 12 | 9 | 5 | 10 | 17 | 11 | 7 | 7 | 9 | 14 | 10 | 12 | |

✓: Priority ✓: Secondary ✓: Complementary

**Table 8**
Number of tags related with the SDGs.

| SDG | ABA | BKT | BKIA | BBVA | CABK | CMAR | IBER | KUX | LBK | SAB | SAN | UNI | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. No poverty | 13 | 16 | 15 | 14 | 33 | 9 | 6 | 18 | 1 | 22 | 29 | 13 | 189 |
| 2. Zero hunger | 4 | 7 | 1 | 0 | 5 | 5 | 1 | 3 | 5 | 4 | 0 | 0 | 35 |
| 3. Good health and well-being | 29 | 42 | 15 | 39 | 29 | 15 | 18 | 44 | 18 | 30 | 30 | 18 | 327 |
| 4. Quality Education | 41 | 57 | 21 | 11 | 14 | 14 | 11 | 12 | 5 | 16 | 38 | 15 | 255 |
| 5. Gender Equality | 8 | 42 | 34 | 31 | 37 | 54 | 15 | 103 | 14 | 19 | 66 | 19 | 442 |
| 6. Clean water and sanitation | 1 | 8 | 5 | 5 | 7 | 16 | 3 | 9 | 4 | 7 | 2 | 8 | 75 |
| 7. Affordable and clean energy | 43 | 61 | 40 | 77 | 80 | 61 | 49 | 53 | 15 | 62 | 132 | 20 | 693 |
| 8. Decent work and economic growth | 78 | 116 | 94 | 120 | 108 | 86 | 87 | 112 | 50 | 69 | 146 | 75 | 1141 |
| 9. Industry, innovation and infrastructure | 46 | 49 | 21 | 43 | 12 | 25 | 11 | 15 | 2 | 11 | 44 | 11 | 290 |
| 10. Reduced inequalities | 45 | 87 | 93 | 81 | 88 | 83 | 48 | 59 | 38 | 43 | 84 | 51 | 800 |
| 11. Sustainable cities and communities | 16 | 43 | 19 | 63 | 44 | 15 | 20 | 30 | 5 | 20 | 20 | 18 | 313 |
| 12. Responsible consumption and production | 27 | 30 | 36 | 32 | 35 | 24 | 33 | 21 | 48 | 21 | 24 | 73 | 404 |
| 13. Climate action | 80 | 102 | 162 | 154 | 153 | 166 | 126 | 63 | 41 | 95 | 194 | 91 | 1427 |
| 14. Life below water | 19 | 1 | 1 | 5 | 2 | 9 | 0 | 1 | 1 | 0 | 2 | 3 | 44 |
| 15. Life on land | 10 | 1 | 0 | 0 | 1 | 7 | 1 | 4 | 2 | 2 | 11 | 1 | 40 |
| 16. Peace, justice and strong institutions | 53 | 115 | 113 | 77 | 61 | 73 | 56 | 83 | 69 | 73 | 40 | 100 | 913 |
| 17. Partnerships for the goals | 15 | 8 | 11 | 8 | 6 | 12 | 9 | 5 | 4 | 7 | 7 | 10 | 102 |
| TOTAL | 528 | 785 | 681 | 760 | 715 | 674 | 494 | 635 | 322 | 501 | 869 | 526 | 7490 |

Our results identify the need for greater efforts to improve the quality of non-financial reporting, as well as further development of the common regulatory framework to enhance comparability between the reports of banking entities. Furthermore, this study shows that natural language processing can be applied to better measure companies' alignment with the SDGs based on the text of their non-financial reports.

More specifically, the results showed that plurality, both in breadth and quality, in the disclosure of non-financial information is still present. The only point in common between all the entities that were studied was the use of the GRI disclosure framework and the identification of the priority SDGs. Differences were presented for all other aspects, even to the point of highlighting that some entities or independent verifiers had not offered all the information. Placing the focus on SDG-related disclosures *per* entity, the range between the maximum and the minimum number of disclosures was 12, while with reference to the total number of tags detected through AI, the range was 547. With regard to the application of the TOPSIS mathematical methodology, so as to classify the banks in accordance with their contribution to the SDGs, it was seen that Banco Santander, with the highest capitalization, was the first in all of the proposed scenarios ($R_i$ closer to 1), whereas Liberbank, situated in the group with the lowest capitalization, was the last ($R_i$ closer to 0).

Centering on the detail and starting with the presentation of the NFIRs, 75% of the entities published their NFIRs as a separate document, an option that represented greater independence and visibility with regard to other information disclosed in other reports. This percentage was greater than in the case of the IBEX 35 firms (EY, 2020) and the firms listed on the Latin-American stock exchanges (GRI & AG Sustentable, 2021) whose percentages were, respectively, 37.5% and 58%.

**Table 9**
The five most frequent tags of each banking entity.

| Size/Bank | Tag 1 | Tag 2 | Tag 3 | Tag 4 | Tag 5 |
|---|---|---|---|---|---|
| EUR 30–50 bn | | | | | |
| CMAR | Climate change | Equality | Climate-related risks and natural disasters | Entrepreneurship | Wage gap |
| IBER | Climate change | Equality | Climate-related risks and natural disasters | Carbon footprint | Corruption |
| LBK | Corporate Social Responsibility | Equality | Collective bargaining | Money laundering | Financing of terrorism |
| EUR 50–75 bn | | | | | |
| ABA | SMES | Equality | Climate change | United Nations Global Compact | Energy Efficiency |
| KUX | Maternity | Paternity | Equality | Collective bargaining | Health crisis and Covid-19 |
| UNI | Corporate Social Responsibility | Climate Change | Money laundering | Equality | Financing of terrorism |
| EUR 75–100 bn | | | | | |
| BKT | Climate change | Equality | Climate-related risks and natural disasters | Entrepreneurship | Money laundering |
| EUR 150–300 bn | | | | | |
| BKIA | SMES | Equality | Climate change | Money laundering | Health crisis and Covid-19 |
| SAB | Corruption | Climate change | Equality | CO2 emissions | Renewable, green and alternative energy |
| EUR 300–500 bn | | | | | |
| CABK | Climate change | Equality | Climate-related risks and natural disasters | Renewable, green and alternative energy | Entrepreneurship |
| EUR 500–1000 bn | | | | | |
| BBVA | Climate change | Equality | Entrepreneurship | Climate-related risks and natural disasters | SMES |
| Above EUR 1000 bn | | | | | |
| SAN | Climate change | Entrepreneurship | Renewable, green and alternative energy | SMES | Climate-related risks and natural disasters |

**Illustration 1.** Word clouds of each entity.

**Table 10**
Standardized weights for each SDG (%).

| SDG | E2030 Tags | COSMA | EY IBEX 35 | KPMG N100 | PWC GLOBAL | PWC SP | UN GC | UN GC SP | UN GC SIG SP | UN GC SP IBEX 35 | GRI LATAM | SDG OB SP | SDG OB FI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SDG 1 | 2.52 | 5.35 | 4.18 | 4.52 | 3.41 | 2.63 | 3.42 | 4.07 | 4.71 | 1.69 | 4.22 | 4.43 | 4.00 |
| SDG 2 | 0.47 | 3.33 | 2.09 | 3.31 | 2.84 | 2.17 | 2.80 | 2.28 | 6.12 | 0.56 | 3.26 | 2.80 | 2.18 |
| SDG 3 | 4.37 | 7.05 | 5.44 | 7.38 | 7.28 | 6.16 | 8.55 | 9.03 | 10.59 | 5.44 | 5.66 | 6.53 | 7.27 |
| SDG 4 | 3.40 | 7.98 | 7.95 | 6.33 | 6.60 | 7.88 | 5.91 | 6.25 | 5.18 | 6.38 | 7.57 | 7.23 | 9.45 |
| SDG 5 | 5.90 | 7.89 | 7.11 | 6.48 | 6.48 | 8.79 | 8.24 | 9.73 | 10.35 | 8.63 | 5.75 | 6.53 | 8.36 |
| SDG 6 | 1.00 | 2.87 | 4.60 | 4.82 | 4.78 | 3.08 | 4.35 | 4.25 | 5.18 | 3.19 | 4.99 | 4.43 | 2.18 |
| SDG 7 | 9.25 | 7.37 | 5.44 | 7.53 | 6.83 | 7.08 | 6.22 | 7.44 | 8.71 | 8.07 | 6.71 | 6.99 | 5.09 |
| SDG 8 | 15.23 | 9.63 | 10.04 | 10.84 | 9.78 | 10.50 | 10.11 | 8.48 | 10.12 | 12.38 | 8.63 | 8.62 | 9.45 |
| SDG 9 | 3.87 | 6.90 | 7.53 | 7.53 | 7.28 | 8.33 | 7.62 | 7.47 | 7.06 | 9.57 | 7.48 | 7.46 | 6.18 |
| SDG 10 | 10.68 | 6.06 | 5.44 | 4.97 | 4.44 | 5.71 | 5.13 | 6.86 | 5.88 | 4.32 | 5.66 | 6.06 | 7.27 |
| SDG 11 | 4.18 | 6.25 | 6.28 | 5.57 | 5.69 | 4.34 | 5.29 | 3.59 | 4.00 | 5.82 | 6.81 | 5.59 | 6.18 |
| SDG 12 | 5.39 | 6.11 | 6.69 | 8.73 | 8.30 | 6.16 | 8.40 | 7.82 | 5.65 | 6.94 | 7.00 | 6.06 | 6.18 |
| SDG 13 | 19.05 | 8.50 | 10.04 | 9.49 | 9.10 | 10.50 | 8.40 | 8.58 | 6.12 | 11.82 | 8.25 | 7.93 | 9.45 |
| SDG 14 | 0.59 | 2.54 | 1.67 | 2.71 | 2.96 | 2.17 | 2.02 | 2.09 | 0.71 | 1.13 | 2.01 | 3.26 | 2.18 |
| SDG 15 | 0.53 | 2.82 | 3.35 | 1.36 | 4.21 | 2.63 | 3.27 | 3.81 | 1.41 | 1.69 | 4.70 | 4.43 | 3.27 |
| SDG 16 | 12.19 | 5.45 | 4.60 | 3.77 | 4.66 | 4.00 | 3.73 | 3.55 | 3.06 | 4.32 | 5.94 | 5.13 | 4.00 |
| SDG 17 | 1.36 | 3.90 | 7.53 | 4.67 | 5.35 | 7.88 | 6.53 | 4.69 | 5.18 | 8.07 | 5.37 | 6.53 | 7.27 |
| Eco | 36.54 | 32.6 | 37.24 | 36.75 | 35.15A | 38.58 | 37.79 | 35.33 | 33.88 | 41.28 | 34.13 | 34.73 | 36.36 |
| Soc | 28.85 | 37.06 | 31.38 | 31.78 | 31.29 | 31.62 | 32.66 | 34.92 | 40.00 | 27.02 | 32.41 | 32.63 | 35.27 |
| Env | 34.61 | 30.34 | 31.38 | 31.48 | 33.56 | 29.79 | 29.55 | 29.75 | 26.12 | 31.71 | 33.46 | 32.63 | 28.36 |

In all, 77% of the NFIRs that were separately published included the term "Report of non-financial information" in their titles, a higher percentage than the 62.5% of IBEX 35 companies that also used it (EY, 2020).

As regards the content indexes incorporated in the NFIRs, 13 modalities were identified among which three different formats were identified to satisfy the contents of Law 11/2018, as well as other additional reporting frameworks. This data contrasts with the eight modalities of the content indexes identified in the study on the IBEX 35 firms (EY, 2020).

Specifically, with regard to Law 11/2018, all the financial entities presented a content index, even though it is true that only 33.33% included the references to specific pages. This finding differed from the results obtained for the IBEX 35 companies, where 81% included content indexes, incorporating both the requirement of the Law and a reference to the page/section number, the reporting framework, and a column for comments on its scope (EY, 2020), or the report of the CNMV (2021), where only 64% of the firms incorporated a contents index for compliance with the Law. We consider it necessary to clarify that the EY report (2020) used the expression *page number/section*, for which reason we were unable to ascertain the number of NFIRs that really referenced specific pages.

In relation with the reporting frameworks and, as with the IBEX 35 companies (EY, 2020), 100% of the financial entities under analysis prepared their NFIRs following the criteria for the GRI disclosure framework of the Global Reporting Initiative. A very similar percentage, 99%, was reflected in the report of the CNMV (2021), on a sample of 142 companies that included 10 of the 12 banks under study, with the exception of Abanca and Cajamar. In the case of the firms listed on the Latin American stock exchanges (GRI & AG Sustentable, 2021) and those named in the KPMG study, those percentages dropped to 87.8% and to 67%, respectively.

A total of 16.66% of the banking entities chose not to indicate the Core or Comprehensive option when preparing their reports according to the GRI standards, as against 3% of the companies that never did so in the study of CNMV (2021). From among the banks that did indicate the GRI option, those that selected the Comprehensive option (66%) represented a very much higher figure with regard to the number of companies (15.8%) in the CNMV report (2021) and the 41% in the IBEX 35 report (EY, 2020). Those banks that, in contrast, used the Core option (16.66%) represented a percentage that was lower than 22.1% and 25% of all the banks analyzed in the CNMV report (2021) and in the EY report (2020), respectively.

Reporting frameworks other than the GRI were incorporated in the reports of 75% of the banking entities. Specifically, UNEP FI Principles for Responsible Banking predominated among 58.33% of the entities. The EFQM was the only reporting framework that incorporated the EY study (2020) and that the banks never used.

In 83.32% of cases, the independent verifier belonged to one of the four main auditing firms in terms of volume of business in Spain, a very similar figure to the 82% of the report on supervision completed by the CNMV (2021) and the 90% in the study of Latin American firms (GRI & AG Sustentable, 2021).

Although the CNMV (2021) considered it good practice when verification referred to the whole content of NFIR, most information in the NFIRs of the financial entities that was verified was limited to the content indexes stipulated in Law 11/2018 and the selected standards or frameworks, and it never extended to any other additional format that the issuers may have voluntarily decided to include. Only in two cases was the scope of the aforesaid verification unknown, which we considered an anomaly for this sort of entity.

With regard to the disclosures related with the SDGs, it has been demonstrated in our study that 100% of the entities published information on their priority SDGs, although the variations within the reports were startling obvious, complicating any comparisons between entities. The greatest pressure on these entities from the interested parties, especially the regulators and the investors, might have influenced such a high percentage. However, it is necessary to highlight that the SDG-related disclosures were centered on positive contributions to achieve the objectives and that half of the entities offered no detailed information on their negative impacts. This information gap might be due either to the very scarce recognition of negative impacts or to the report managers who are still to apply a well-defined methodology for the calculation of the impacts. As a sample of the latter, Banco Santander, in its reporting of the UNEP FI Principles for Responsible Banking, stated that "*we will continue improving knowledge of the impacts of our activities including those related with our objectives and where necessary, will establish actions for mitigation*". From among the 5200 firms that were analyzed in the KPMG report (2020), only 14% of firms presented a balance in their reports between positive and negative impacts, due perhaps to the limitations described in relation to the impacts.

In any event, the results of our study on SDG-related disclosures were higher than the results of other works. Thus, these sorts of disclosures ascended to almost 90% of the NFIRs that were analyzed in the study completed by the CNMV (2021), although the same body

**Table 11**
Ranking of entities based on their closeness coefficient.

| | Scenario 1 | | Scenario 2 | | Scenario 3 | | Scenario 4 | | Scenario 5 | | Scenario 6 | | Scenario 7 | | Scenario 8 | | Scenario 9 | | Scenario 10 | | Scenario 11 | | Scenario 12 | | Scenario 13 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | E2030 Tags | | COSMA | | EY IBEX 35 | | KPMG N100 | | PWC GLOBAL | | PWC SP | | UN GC | | UN GC SP | | UN GC SIG SP | | UN GC SP IBEX 35 | | GRI LATAM | | SDG OB SP | | SDG OB FI | |
| Entity | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ | Rk | $R_i$ |
| ABA | 11 | 0.28 | 6 | 0.42 | 5 | 0.44 | 7 | 0.41 | 5 | 0.44 | 6 | 0.44 | 7 | 0.41 | 7 | 0.40 | 7 | 0.36 | 7 | 0.42 | 4 | 0.45 | 3 | 0.47 | 5 | 0.44 |
| BKIA | 4 | 0.53 | 2 | 0.57 | 2 | 0.56 | 2 | 0.54 | 2 | 0.53 | 2 | 0.56 | 2 | 0.53 | 2 | 0.52 | 2 | 0.56 | 2 | 0.55 | 2 | 0.56 | 2 | 0.54 | 2 | 0.57 |
| BKT | 5 | 0.53 | 8 | 0.36 | 8 | 0.39 | 8 | 0.36 | 8 | 0.35 | 8 | 0.39 | 8 | 0.36 | 8 | 0.35 | 8 | 0.33 | 8 | 0.40 | 8 | 0.36 | 8 | 0.35 | 8 | 0.38 |
| BBVA | 2 | 0.59 | 3 | 0.47 | 3 | 0.47 | 3 | 0.49 | 3 | 0.46 | 3 | 0.47 | 4 | 0.47 | 5 | 0.44 | 6 | 0.44 | 3 | 0.52 | 3 | 0.47 | 4 | 0.46 | 3 | 0.45 |
| CABK | 3 | 0.56 | 5 | 0.44 | 7 | 0.42 | 4 | 0.45 | 7 | 0.41 | 7 | 0.40 | 6 | 0.42 | 6 | 0.41 | 5 | 0.45 | 6 | 0.43 | 6 | 0.43 | 7 | 0.41 | 7 | 0.41 |
| CMAR | 6 | 0.52 | 7 | 0.41 | 4 | 0.45 | 5 | 0.44 | 4 | 0.45 | 5 | 0.45 | 5 | 0.44 | 4 | 0.45 | 4 | 0.46 | 4 | 0.46 | 5 | 0.44 | 5 | 0.45 | 6 | 0.42 |
| IBER | 8 | 0.36 | 11 | 0.23 | 11 | 0.25 | 11 | 0.25 | 11 | 0.24 | 11 | 0.25 | 11 | 0.24 | 11 | 0.22 | 11 | 0.21 | 10 | 0.28 | 11 | 0.23 | 11 | 0.23 | 11 | 0.24 |
| KUX | 7 | 0.42 | 4 | 0.46 | 6 | 0.43 | 6 | 0.43 | 6 | 0.42 | 4 | 0.45 | 3 | 0.47 | 3 | 0.50 | 3 | 0.55 | 5 | 0.45 | 7 | 0.41 | 6 | 0.42 | 4 | 0.45 |
| LBK | 12 | 0.14 | 12 | 0.16 | 12 | 0.15 | 12 | 0.19 | 12 | 0.18 | 12 | 0.13 | 12 | 0.18 | 12 | 0.16 | 12 | 0.20 | 12 | 0.13 | 12 | 0.17 | 12 | 0.15 | 12 | 0.13 |
| SAB | 10 | 0.31 | 9 | 0.29 | 10 | 0.27 | 10 | 0.29 | 10 | 0.27 | 10 | 0.26 | 10 | 0.27 | 10 | 0.27 | 9 | 0.31 | 11 | 0.26 | 10 | 0.28 | 10 | 0.28 | 10 | 0.26 |
| SAN | 1 | 0.68 | 1 | 0.59 | 1 | 0.58 | 1 | 0.56 | 1 | 0.56 | 1 | 0.61 | 1 | 0.56 | 1 | 0.60 | 1 | 0.57 | 1 | 0.63 | 1 | 0.56 | 1 | 0.57 | 1 | 0.59 |
| UNI | 9 | 0.34 | 10 | 0.29 | 9 | 0.32 | 9 | 0.34 | 9 | 0.34 | 9 | 0.29 | 9 | 0.34 | 9 | 0.31 | 10 | 0.26 | 9 | 0.31 | 9 | 0.32 | 9 | 0.30 | 9 | 0.29 |
| MIN | | 0.14 | | 0.16 | | 0.15 | | 0.19 | | 0.18 | | 0.13 | | 0.18 | | 0.16 | | 0.20 | | 0.13 | | 0.17 | | 0.15 | | 0.13 |
| MAX | | 0.68 | | 0.59 | | 0.58 | | 0.56 | | 0.56 | | 0.61 | | 0.56 | | 0.60 | | 0.57 | | 0.63 | | 0.56 | | 0.57 | | 0.59 |
| AVERAGE | | 0.44 | | 0.39 | | 0.40 | | 0.40 | | 0.39 | | 0.39 | | 0.39 | | 0.39 | | 0.39 | | 0.40 | | 0.39 | | 0.39 | | 0.39 |

Rk: Ranking; $R_i$: closeness coefficient.

highlighted that they could improve aspects related to how the activities of the companies contributed to reaching those objectives or were in progress for their achievement over the financial year. The study of Curtó-Pagès, Ortega-Rivera, Castellón-Durán and Jané-Llopis (2021), which covered a sample of 58 listed Spanish companies between 2016 and 2019, found general mentions to the SDGs in 86.2% of the reports from 2019, whereas the financial sector reached a figure in that same year of 100%.

The large consultancy firms also completed studies, the results of which were as follows: 84% of the IBEX 35 firms (EY, 2020); 69% of the global companies that were analyzed; 83% of the Top 100 Spanish companies (KPMG, 2020); 72% of the global companies; 78% of the Spanish companies; and, by sectors, 74% of the global companies from the financial sector that are leaders within this field (PWC, 2019). With regard to the UN Global Compact and DNV GL (2020), the figure was 84% of global companies, whereas in Spain the figures were 99.43% (Large Firms) and 83.25% (Micro-enterprises and Small & Medium enterprises) (UN Global Compact. Network Spain, 2020a), also offering information on the Spanish signatories to the Global Compact (66%) and the firms listed on IBEX 35 (86%) (UN Global Compact. Network Spain, 2020b). In the case of Latin America, 88% of the companies mentioned them and 81% both identified them and prioritized them (GRI & AG Sustentable, 2021). Finally, the SDG Observatory, 2020 registered 47.44% of the Spanish companies under analysis.

With respect to the SDGs that were disclosed, SDGs 8 (Decent work and economic growth), 13 (Climate Action), and 4 (Quality Education) were mentioned by all the banking entities, followed by SDGs 5 (Gender equality), 10 (Reduction of inequalities), and 17 (Alliance to achieve the objectives). Fewer measures for action were registered both for SDG 2 (Zero hunger) and for SDG 14 (Life below water). If compared with specific studies on banks, the results were very similar. Thus, Cosma, Venturelli, Schwizer and Boscia (2020) obtained the same results for the first four positions, in a sample of reports of non-financial information from 223 European banks over the financial year 2017, with SDG 8 (91% of banks) leading the ranking, followed by SDGs 13 (81%), 4 (76%), and 5 (75%). Those that received the least attention were SDGs 15 (Life on land) (27%) and 14 (Life Below Water) (24%). Gallego-Sosa, Gutiérrez-Fernández, Fernández-Torres and Nevado-Gil (2021) found that the highest number of initiatives were associated with SDGs 8, 13, and 4 in a sample of 30 European banks from the 2017 financial year.

In the study of Curtó-Pagès, Ortega-Rivera, Castellón-Durán and Jané-Llopis (2021), it was found that the SDGs 13, 8, 9, 4, 5, 17, and 10 occupied the first positions and 14 and 2 occupied the last two. As may be observed, except for SDG 9 (Industry, innovation and infrastructure), the similarities with the results of our study are very high. In a systematic review of the literature, Mio, Fasan, Marcon and Panfilo (2020) found that certain SDGs were discussed more than any others: SDG 9, with 57% of articles in the full sample mentioning specific goals; SDG 3 (Good Health and Well-Being) with 43%; and SDGs 6 (Clean Water and Sanitation), 12 (Responsible Consumption and Production), and 13, each mentioned in 36% of the studies. As may be observed, there was no similarity with our results, given that there was only a coincidence with SDG 13. In turn, in the study of Heras-Saizarbitoria, Urbieta and Boiral (2022), on a sample of 1370 organizations from 97 countries an explicit prioritization of the most frequently mentioned ones was established: SDGs, 8, 12, and 13. The least frequently mentioned were SDGs 14 and 2. These results do present an important similarity with those obtained in our study, with the exception of SDG 12. Along the same lines, the work of Hummel and Szekely (2022), with a sample of 652 reports from European firms, found that the most highly prioritized were SDGs 8, 13, 12, 3, and 9, the first two coinciding with our results. Tsalis, Malamateniou, Koulouriotis and Nikolaou (2020) found that firms provided more information on the following SDG-related actions: SDGs 7

(Affordable and clean energy), 9, and 13. However, the sustainability reports that were examined failed to inform interested parties fully on SDG 16 (Peace, Justice and Strong Institutions). They also found that the industry sector was a factor that appeared to affect the reporting practices of firms on SDG-related actions.

Other general studies have also presented similar results. For example, EY (2020) analyzed a sample of firms, 75% of which made higher contributions to SDGs 8 and 13, and highlighted their contributions to SDGs 4, 9, 17, and 5. Those that received fewest contributions, as in our study, were SDGs 2 and 14. PWC (2019) pointed out in its report that higher contributions at a global level were to SDGs 8, 13, 12, 3, and 9, and SDGs 8, 13, 4, 5, and 9 were prioritized within the financial sector. With respect to Spain, SDGs 8, 13, 5, 9, and 4 received greater global contributions. Three categories were distinguished in the case of KPMG (2020). The most highly prioritized (over 50% of the firms): SDGs 8, 13, 12, 7, and 9; the moderately prioritized (between 31% and 50%): SDGs 3, 5, 4, 11, 10, 6, and 17; and the least prioritized (30% of firms or fewer): SDGs 1, 16, 2, 14, and 15. UN Global Compact and DNV GL (2020) reported a higher contribution to SDGs 8, 9, 12, 13, and 3. In the case of the financial services sector, the most highly prioritized were SDGs 8, 5, 13, 17, and 9 and the least prioritized were SDGs 6, 12, and 14. UN Global Compact. Network Spain (2020a) reported that 82.44% of the large firms identified priority SDGs, the most frequently selected being 5, 3, 13, and 8. Moreover, 65% of Spanish firms linked to the Global Compact and 80% of firms belonging to IBEX 35 prioritized the SDGs (UN Global Compact. Network Spain, 2020b). More specifically, the priority SDGs of those firms were 3, 5, 8, 7, 9, and 13; the priority SDGs of the IBEX 35 were 8, 13, 9, 5, and 17; those of the financial sector were 3, 5, 7, and 8; and the priority SDGs of the financial services companies of banks and life assurance companies listed on the IBEX 35 were 8, 13, 5, 4, and 17. In the study of GRI and AG Sustentable (2021), centered on Latin America, SDG 8 was the most highly prioritized, after which came SDG 13. In contrast, SDGs 2 and 14 were situated at the lower end of the list. Finally, according to the SDG Observatory, 2020, the most highly prioritized were SDGs 8, 9, and 13, while SDGs 4, 5, 7, and 10 gained increasingly greater weight, leaving SDGs 2 and 14 trailing far behind.

In line with the PWC report (2019), we must highlight the fact that the entities reporting on the SDG goals did so more with a qualitative component relating to their intentions (in other words, a narrative is drafted on the plans of the firm to take measures), than with quantitative measures to achieve them. Likewise, UN Global Compact. Network Spain (2020a) mentioned that the firms from its study identified the strategic SDGs, but there was little training, objectives, and measurement.

There was even a minority of entities (41.66%; Abanca, Bankinter, Cajamar, Sabadell and Unicaja Banco), a very similar percentage to the 40% of entities on the IBEX 35, which included a correlation between SDGs and GRI indicators, SDGs and material topics, and SDGs and reporting sections (UN Global Compact. Network Spain, 2020b).

The average number of SDGs that each entity mentioned was 9.83, a very similar figure to the one in the study of Cosma, Venturelli, Schwizer and Boscia (2020), both in Spain (10), and in the 22 European countries under study (8.9). It was likewise similar to the figures from the PWC report (2019), both at a global level (9) and in Spain (9).

Considering the SDGs in the three dimensions of economic, social, and environmental sustainability, the entities in our study prioritized the economic (36.54%), and the environmental (34.61%), rather than the social (28.85%) dimensions. In the study of Cosma, Venturelli, Schwizer and Boscia (2020) on European banks, the figures differed, with the greatest weight given to the social dimension (37.06%), and then to the economic (32.6%), and to the environmental (30.43%) dimensions. In the case of the UN Global Compact. Network Spain (2020a) study, there was a slight prioritization of economic and social SDGs (each one 35%) over and above the environmental ones (30%). If the weights of the SDGs are considered for each report or article (Table 10), the dimensions of our study have greater similarity with those computed for the 1141 firms from the PWC study (2019). In concrete, 35.15% for the economic, 33.56% for the environmental, and 31.29% for the social dimensions.

With respect to the results obtained after the application of the NLP tool, *Escáner2030*, the maximum number of tags was associated with SDG 13, followed by SDG 8. In other words, there was a coincidence between the results of the software tool and what the entities had noted, specifically in the section on SDGs, in their NFIRs. In contrast, despite all the entities having mentioned SDG 4 in their NFIRs, given the importance attached to financial education programs and grants, among others, SDG 4 occupied position 11 with respect to the number of tags that the tool detected throughout the NFIRs.

It is important to mention, in addition, that the most commonly used tag of interest among the entities, Climate Change, is also related to SDG 13. This observation appears to indicate that the financial sector has, in good measure, assumed its function in the long and complex process that the transition to sustainability has come to represent, in the first phase of which the environmental and climatic risks are precisely those that generate greater concern, without it implying that the risks for people should be delayed (López-Jiménez, 2021). Along these lines, the European Central Bank will, in 2022, lead the design and the launch of the first climate-change stress tests to which principal banking entities in the Banking Union will be subjected.

With regard to the hierarchy of the entities, according to the SDG-related disclosures, the results indicated that, at higher levels of capitalization, there was a greater possibility of occupying the leading positions. However, the position of Sabadell attracts attention, which despite being among the five entities with the highest capitalization, stayed in tenth position, except for the scenario in which it was in ninth position.

Finally, it must be pointed out that the present study has various limitations. The first is that the tool, *Escáner2030*, only scans text in Spanish and it has not been possible to incorporate samples from other European entities within it for comparative purposes. The second is that the NLP techniques never ensure 100% reliability and there can be errors with results. The third is that the inexistence of weights in the literature on applying the TOPSIS mathematical methodology has made their calculation necessary for each SDG. Those weights were on many occasions estimated on the basis of reports that included firms that were not exclusively part of the banking sector, with which, the ranking calculated in those scenarios might not be a faithful reflection of the behavior of that sector. The fourth is that few banks were examined, despite which the results of the analysis could give a picture of reporting attitudes towards the challenges of the 2030 Agenda.

## References

Agostini, M., Costa, E., & Korca, B. (2022). Non-Financial Disclosure and Corporate Financial Performance Under Directive 2014/95/EU: Evidence from Italian Listed Companies. *Accounting in Europe*, *19*(1), 78–109. doi:10.1080/17449480.2021.1979610.

Aras, G., Tezcan, N., Furtuna, O. K., & Kazak, E. H. (2017). Corporate Sustainability Measurement based on Entropy Weight and TOPSIS: A Turkish Banking Case Study. *Meditari Accountancy Research*, *25*(3), 391–413. doi:10.1108/MEDAR-11-2016-0100.

Aureli, S., Magnaghi, E., & Salvatori, F. (2019). The role of existing regulation and discretion in Harmonising non-financial disclosure. *Accounting in Europe*, *16*(3), 290–312. doi:10.1080/17449480.2019.1637529.

Aureli, S., Salvatori, F., & Magnaghi, E. (2020). A Country-Comparative Analysis of the Transposition of the EU Non-Financial Directive: An Institutional Approach. *Accounting, Economics and Law: A Convivium*, *10*(2), 20180047. doi:10.1515/ael-2018-0047.

Avrampou, A., Skouloudis, A., Iliopoulos, G., & Khan, N. (2019). Advancing the Sustainable Development Goals: Evidence from leading European banks. *Sustainable Development*, *27*, 743–757. doi:10.1002/sd.1938.

Baldini, M., Maso, L. D., Liberatore, G., Mazzi, F., & Terzani, S. (2018). Role of Country- and Firm-Level Determinants in Environmental, Social, and Governance Disclosure. *Journal of Business Ethics*, *150*, 79–98. doi:10.1007/s10551-016-3139-1.

Bebbington, J., Kirk, E., & Larrinaga, C. (2012). The Production of Normativity: A Comparison of Reporting Regimes in Spain and the UK. *Accounting Organizations and Society*, *37*(2), 78–94. doi:10.1016/j.aos.2012.01.001.

Bennich, T., Weitz, N., & Carlsen, H. (2020). Deciphering the scientific literature on SDG interactions: A review and reading guide. *Science of the Total Environment*, *728*, 138405–138423. doi:10.1016/j.scitotenv.2020.138405.

Biermann, F., Kanie, N., & Kim, R. E. (2017). Global governance by goal-setting: The novel approach of the UN Sustainable Development Goals. *Current Opinion in Environmental Sustainability*, *26*, 26–31. doi:10.1016/j.cosust.2017.01.010 -*27*.

Bini, L., Dainelli, F., & Giunta, F. (2017). Is a loosely specified regulatory intervention effective in discipline management commentary. The case of performance disclosure indicator. *Journal of Management and Governance*, *21*(1), 63–91. doi:10.1007/s10997-015-9334-0.

Biondi, L., Dumay, J., & Monciardini, D. (2020). Using the International Integrated Reporting Framework to comply with EU Directive 2014/95/EU: Can we afford another reporting façade? *Meditari Accountancy Research*, *28*(5), 889–914. doi:10.1108/MEDAR-01-2020-0695.

Brooks, C., & Oikonomou, I. (2018). The effects of environmental, social and governance disclosures and performance on firm value: A review of the literature in accounting and finance. *The British Accounting Review*, *50*(1), 1–15. doi:10.1016/j.bar.2017.11.005.

Buallay, A. (2019). Is sustainability reporting (ESG) associated with performance? Evidence from the European banking sector. *Management of Environmental Quality*, *30*(1), 98–115. https://www.emerald.com/insight/content/doi/10.1108/MEQ-12-2017-0149/full/html.

Caputo, F., Leopizzi, R., Pizzi, S., & Milone, V. (2020). The Non-Financial Reporting Harmonization in Europe: Evolutionary Pathways. Related to the Transposition of the Directive 95/2014/EU within the Italian Context. *Sustainability*, *12*(1), 92–104. doi:10.3390/su12010092.

Chen, M., Mussalli, G., Amel-Zadeh, A., & Weinberg, M. O. (2022). NLP for SDGs: Measuring Corporate Alignment with the Sustainable Development Goals. *The Journal of Impact and ESG Investing*, *2*(3), 61–81. doi:10.3905/jesg.2021.1.035.

CNMV (2021). *Informe sobre la supervisión por la CNMV de los informes financieros anuales y principales áreas de revisión del ejercicio siguiente. Ejercicio 2019*. Retrieved from https://www.cnmv.es/DocPortal/Publicaciones/Informes/IA_2019.pdf. Accessed June 22, 2021.

CNMV (2022). *Boletín Internacional. Marzo*. Retrieved from http://www.boletininternacionalcnmv.es/ficha.php?menu_id=3&jera_id=49&cont_id=991. Accessed May 22, 2022.

Conforti, C., Hirmer, S., Morgan, D., Basaldella, M., & Or, Y. Ben (2020). Natural language processing for achieving sustainable development: The case of neural labelling to enhance community profiling. *In Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP)* (pp. 8427–8444). doi:10.18653/v1/2020.emnlp-main.677 Online. Association for Computational Linguistics.

Cosma, S., Venturelli, A., Schwizer, P., & Boscia, V. (2020). Sustainable Development and European Banks: A Non-Financial Disclosure Analysis. *Sustainability*, *12*(15), 6146–6164. doi:10.3390/su12156146.

Costa, E., & Agostini, M. (2016). Mandatory Disclosure about Environmental and Employee Matters in the Reports of Italian-Listed Corporate Groups, Social and Environmental. *Accountability Journal*, *36*(1), 10–33. doi:10.1080/0969160X.2016.1144519.

Curtó-Pagès, F., Ortega-Rivera, E., Castellón-Durán, M., & Jané-Llopis, E. (2021). Coming in from the Cold: A Longitudinal Analysis of SDG Reporting Practices by Spanish Listed Companies Since the Approval of the 2030 Agenda. *Sustainability*, *13*(3), 1178–1204. doi:10.3390/su13031178.

Diaz-Sarachaga, J. M. (2021). Shortcomings in reporting contributions towards the sustainable development goals. *Corporate Social Responsibility and Environmental Management*, *28*(4), 1299–1312. doi:10.1002/csr.2129.

Doni, F., Bianchi Martini, S., Corvino, A., & Mazzoni, M. (2020). Voluntary versus mandatory non-financial disclosure: EU Directive 95/2014 and sustainability reporting practices based on empirical evidence from Italy. *Meditari Accountancy Research*, *28*(5), 781–802. doi:10.1108/MEDAR-12-2018-0423.

Dumitru, M., Dyduch, J., Guşe, R. G., & Krasodomska, J. (2017). Corporate Reporting Practices in Poland and Romania – An Ex-ante Study to the New Non-financial Reporting European Directive. *Accounting in Europe*, *14*(3), 279–304. doi:10.1080/17449480.2017.1378427.

Elalfy, A., Weber, O., & Geobey, S. (2021). The Sustainable Development Goals (SDGs): A rising tide lifts all boats? Global reporting implications in a post SDGs world. *Journal of Applied Accounting Research*, *22*(3), 557–575. doi:10.1108/JAAR-06-2020-0116.

Erkens, M., Paugam, L., & Stolowy, H. (2015). Non-financial information: State of the art and research perspectives based on a bibliometric study. *Comptabilité Contrôle Audit*, *21*, 15–92. doi:10.3917/cca.213.0015.

European Central Bank (2020). *List of supervised entities*. Retrieved from https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.listofsupervisedentities202101.en.pdf?09365215a73c5a88f140114eb67b2202. Accessed June 3, 2021.

European Commission (n.d.). *Overview of sustainable finance*. Retrieved from https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance_en. Accessed November 14, (2021).

European Commission (2021). *Strategy for financing the transition to a sustainable economy COM/2021/390 final, 6 July*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0390. Accessed September 2, 2021.

European Parliament and the Council. (2014). *Directive 2014/95/EU of the european parliament and the council of 22 october 2014 amending directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups*Brussels, Belgium: EU Commission. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0095. Accessed May 10, 2021.

European Parliamentary Research Service (2021). *Non-financial Reporting Directive. Briefing Implementation Appraisal*. Retrieved from https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/654213/EPRS_BRI(2021)654213_EN.pdf. Accessed June 25, 2021.

European Securities and Markets Authority (2020). *European common enforcement priorities for 2020 annual financial reports*. Retrieved from https://www.esma.europa.eu/sites/default/files/library/esma32-63-1041_public_statement_on_the_european_common_enforcement_priorities_2020.pdf. Accessed June 25, 2021.

Evangelinos, K., Skoulloudis, A., Nikolaou, I., & Filho, W. L. (2009). An Analysis of Corporate Social Responsibility (CSR) and Sustainability Reporting Assessment in the Greek Banking Sector. In S. Idowu, & W. Leal Filho (Eds.), *Professionals' perspectives of corporate social responsibility* (1st ed.). (pp. 157–173). Berlin: Springer Berlin Heidelberg. doi:10.1007/978-3-642-02630-0_9.

EY (2020). *III Informe comparativo sobre los Estados de la Información No Financiera (EINF) del IBEX 35*. Retrieved from https://www.ey.com/es_es/climate-change-sustainability-services/como-ha-reportado-el-ibex35-la-informacion-no-financiera-en-2019. Accessed June 20, 2021.

Fisher, I. E., Garnsey, M. R., & Hughes, M. E. (2016). Natural Language Processing in Accounting, Auditing and Finance: A Synthesis of the Literature with a Roadmap for Future Research. *Intelligent Systems in Accounting. Finance and Management*, *23*(3), 157–214. doi:10.1002/isaf.1386.

Gallego-Sosa, C., Gutiérrez-Fernández, M., Fernández-Torres, Y., & Nevado-Gil, M. T. (2021). Corporate social responsibility in the European banking sector: Commitment to the 2030 Agenda and its relationship with gender diversity. *Sustainability*, *13*(4), 1731–1753. doi:10.3390/su13041731.

Gangi, F., Meles, A., D'Angelo, E., & Daniele, L. M. (2019). Sustainable development and corporate governance in the financial system: Are environmentally friendly banks less risky? *Corporate Social Responsibility and Environmental Management*, *26*(3), 529–547. doi:10.1002/csr.1699.

García-Benau, M. A., Bollas-Araya, H. M., & Sierra-García, L. (2022). Non-financial reporting in Spain. The effects of the adoption of the 2014 EU Directive. *Spanish Accounting Review*, *25*(1), 3–15. doi:10.6018/rcsar.392631.

García-Sánchez, I. M., Rodríguez-Ariza, L., Aibar-Guzmán, B., & Aibar-Guzmán, C. (2020). Do institutional investors drive corporate transparency regarding business contribution to the sustainable development goals? *Business Strategy and the Environment*, *29*, 2019–2036. doi:10.1002/bse.2485.

Govindan, K., Khodaverdi, K., & Jafarian, A. (2013). A fuzzy multi criteria approach for measuring sustainability performance of a supplier based on triple bottom line approach. *Journal of Cleaner Production*, *47*, 345–354. doi:10.1016/j.jclepro.2012.04.014.

GRI & AG Sustentable (2021). *Divulgación ASG y de sostenibilidad en mercados de capitales. Una mirada a América Latina*. Retrieved from https://agsustentable.com/ag_lab/DivulgacionASGydeSostenibilidadenMercadosdeCapitales-UnamiradaaAmericaLatina.pdf. Accessed June 20, 2021.

GRI, the UN Global Compact, & the World Business Council for Sustainable Development (WBCSD) (2015). *SDG Compass: The guide for business action on the SDGs*. Retrieved from https://sdgcompass.org/wp-content/uploads/2015/12/019104_SDG_Compass_Guide_2015.pdf. Accessed May 12, 2022.

Gunawan, J., Permatasari, P., & Tilt, C. (2020). Sustainable development goal disclosures: Do they support responsible consumption and production? *Journal of Cleaner Production*, *246*, 118989–119000. doi:10.1016/j.jclepro.2019.118989.

Gusmão Caiado, R. G., Leal Filho, W., Quelhas, O. L. G., Luiz de Mattos Nascimento, D., & Ávila, L. V. (2018). A literature-based review on potentials and constraints in the implementation of the sustainable development goals. *Journal of Cleaner Production*, *198*, 1276–1288. doi:10.1016/j.jclepro.2018.07.102.

Haller, A., Link, M., & Groß, T. (2017). The Term 'Non-financial Information' – A Semantic Analysis of a Key Feature of Current and Future Corporate Reporting. *Accounting in Europe*, *14*(3), 407–429. doi:10.1080/17449480.2017.1374548.

Heras-Saizarbitoria, I., Urbieta, L., & Boiral, O. (2022). Organizations' engagement with sustainable development goals: From cherry-picking to SDG-washing? *Corporate Social Responsibility and Environmental Management*, *29*(2), 316–328. doi:10.1002/csr.2202.

Huang, X. B., & Watson, L. (2015). Corporate social responsibility research in accounting. *Journal of Accounting Literature*, *34*, 1–16. doi:10.1016/j.acclit.2015.03.001.

Hummel, K., & Szekely, M. (2022). Disclosure on the Sustainable Development Goals – Evidence from Europe. *Accounting in Europe*, *19*(1), 152–189. doi:10.1080/17449480.2021.1894347.

Hwang, C.-. L., & Yoon, K. (1981). Methods and Applications. A State-of-the-Art Survey. *Multiple attribute decision making*. Berlin, Heidelberg: Springer. doi:10.1007/978-3-642-48318-9.

Ioannou, I., & Serafeim, G. (2015). The impact of corporate social responsibility on investment recommendations: Analysts' perceptions and shifting institutional logics. *Strategic Management Journal*, *36*, 1053–1081. doi:10.1002/smj.2268.

Izzo, M. F., Ciaburri, M., & Tiscini, R. (2020). The Challenge of Sustainable Development Goal Reporting: The First Evidence from Italian Listed Companies. *Sustainability*, *12*(8), 3494–3511. doi:10.3390/su12083494.

Jackson, G., Bartosch, J., Avetisyan, E., Kinderman, D., & Knudsen, J. S. (2020). Mandatory Non-financial Disclosure and Its Influence on CSR: An International Comparison. *Journal of Business Ethics*, *162*, 323–342. doi:10.1007/s10551-019-04200-0.

Korca, B., & Costa, E. (2021). Directive 2014/95/EU: Building a research agenda. *Journal of Applied Accounting Research*, *22*(3), 401–422. doi:10.1108/JAAR-05-2020-0085.

KPMG (2020). *The time has come. The KPMG Survey of Sustainability Reporting 2020*. Retrieved from https://home.kpmg/xx/en/home/insights/2020/11/the-time-has-come-survey-of-sustainability-reporting.html. Accessed June 24, 2021.

Lafortune, G., Fuller, G., Moreno, J., Schmidt-Traub, G., & Kroll, C. (2018). *SDG Index and Dashboards. Detailed Methodological paper*. Retrieved from https://www.mdri.org.vn/vsdg/2019_UN_LNOB_Ethnic_Minority/1.%20SDG%20database/1.SDGINDEX.ORG/2018_SDG_GLobalIndex/2018_SDG_GlobalIndexMethodology.pdf. Accessed June 27, 2021.

La Torre, M., Sabelfeld, S., Blomkvist, M., Tarquinio, L., & Dumay, J. (2018). Harmonising non-financial reporting regulation in Europe: Practical forces and projections for future research. *Meditari Accountancy Research*, *26*(4), 598–621. doi:10.1108/MEDAR-02-2018-0290.

Lewis, C., & Young, S. (2019). Fad or future? Automated analysis of financial text and its implications for corporate reporting. *Accounting and Business Research*, *49*(5), 587–615. doi:10.1080/00014788.2019.1611730.

Liddy, E. D. (2001). Natural Language Processing. *Encyclopedia of library and information science*. (2nd Ed). NY: Marcel Decker, Inc.

López Jiménez, J.M. (.2021). *La primera prueba de resistencia climática del Banco Central Europeo*. Retrieved from https://www.socialinvestor.es/regulacion/la-primera-prueba-de-resistencia-climatica-del-banco-central-europeo/. Accessed December 5, 2021.

López-Jiménez, J. M., & Zamarriego-Muñoz, A. (2021). *La sostenibilidad y el nuevo marco institucional y regulatorio de las finanzas sostenibles*. Pamplona: Thomson Reuters Aranzadi.

Luque-Vílchez, M., & Larrinaga, C. (2016). La regulación de la información no financiera en España a través de la Ley de Economía Sostenible y la Directiva 2014/95/UE. *Revista contable*, (49), 102–107.

Madrid Stock Exchange (2021). *Búsqueda de Emisora*. Retrieved from https://www.bolsamadrid.es/esp/aspx/Empresas/BusqEmpresas.aspx?busq=. Accessed June 5, 2021.

Mandic, K., Delibasic, B., Knezevic, S., & Benkovic, S. (2014). Analysis of the financial parameters of Serbian banks through the application of the fuzzy AHP and TOPSIS methods. *Economic Modelling*, *43*, 30–37. doi:10.1016/j.econmod.2014.07.036.

Mio, C., Fasan, M., Marcon, C., & Panfilo, S. (2020). The predictive ability of legitimacy and agency theory after the implementation of the EU directive on non-financial information. *Corporate Social Responsibility and Environmental Management*, *27*(6), 2465–2476. doi:10.1002/csr.1968.

Mion, G., & Loza, C. R. (2019). Mandatory Nonfinancial Disclosure and Its Consequences on the Sustainability Reporting Quality of Italian and German Companies. *Sustainability*, *11*(17), 4612–4639. doi:10.3390/su11174612.

Miralles-Quirós, M. M., Miralles-Quirós, J. L., & Redondo-Hernández, J. (2019). ESG Performance and Shareholder Value Creation in the Banking Industry: International Differences. *Sustainability*, *11*(5), 1404–1418. doi:10.3390/su11051404.

Moreno, A. I., & Caminero, T. (2020). Application of text mining to the analysis of climate-related disclosures. *Banco de España*. Retrieved from https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosTrabajo/20/Files/dt2035e.pdf. Accessed June 24, 2021.

Nicolò, G., Zampone, G., Sannino, G., & De Iorio, S. (2021). Sustainable corporate governance and non-financial disclosure in Europe: Does the gender diversity matter? *Journal of Applied Accounting Research*, *23*(1), 227–249. doi:10.1108/JAAR-04-2021-0100.

Oral, C. (2016). Evaluating the financial performances of privately owned deposit banks in Turkey by Topsis method. *Journal of Business Research Turk*, *8*(1), 448–455. doi:10.20491/isader.2016.153.

Ordonez-Ponce, E., & Khare, A. (2021). GRI 300 as a measurement tool for the United Nations sustainable development goals: Assessing the impact of car makers on sustainability. *Journal of Environmental Planning and Management*, *64*(1), 47–75. doi:10.1080/09640568.2020.1746906.

Perrault Crawford, E., & Clark Williams, C. (2010). Should corporate social reporting be voluntary or mandatory? Evidence from the banking sector in France and the United States. *Corporate Governance*, *10*(4), 512–526. doi:10.1108/14720701011069722.

Pizzi, S., Rosati, F., & Venturelli, A. (2021). The determinants of business contribution to the 2030 Agenda: Introducing the SDG Reporting Score. *Business Strategy and the Environment*, 30(1), 404–421. https://doi.org/10.1002/bse.2628

PWC (2019). *Creating a strategy for a better world. How the Sustainable Development Goals can provide the framework for business to deliver progress on our global challenges*. Retrieved from https://www.pwc.com/gx/en/sustainability/SDG/sdg-2019.pdf. Accessed June 24, 2021.

PWC (2021). *Management of non-financial information: Corporate value creation insights from advanced case studies*. Retrieved from https://www.pwc.com/jp/en/knowledge/thoughtleadership/assets/pdf/non-financial-information-management.pdf. Accessed December 12, 2021.

Qureshi, M. A., Kirkerud, S., Theresa, K., & Ahsan, T. (2020). The impact of sustainability (environmental, social, and governance) disclosure and board diversity on firm value: The moderating role of industry sensitivity. *Business Strategy and the Environment*, *29*, 1199–1214. doi:10.1002/bse.2427.

Rosati, F., & Faria, L. (2019). Addressing the SDGs in sustainability reports: The relationship with institutional factors. *Journal of Cleaner Production*, *215*, 1312–1326. doi:10.1016/j.jclepro.2018.12.107.

Rosati, F., & Faria, L. (2019). Business contribution to the Sustainable Development Agenda: Organizational factors related to early adoption of SDG reporting. *Corporate Social Responsibility and Environmental Management*, *26*(3), 588–597. doi:10.1002/csr.1705.

Santos, A. L., & Rodrigues, L. L. (2021). Banks and Climate-Related Information: The Case of Portugal. *Sustainability*, *13*(21), 12215–12234. doi:10.3390/su132112215.

SDG Observatory. (2020). La contribución de las empresas españolas a los Objetivos de Desarrollo Sostenible. *Tercer Informe*. Retrieved from https://www.esade.edu/itemsweb/wi/research/catedra_liderazgos/OBS-2020-DIG-CAST.pdf. Accessed June 19, 2021.

Sepasi, S., Rahdari, A., & Rexhepi, G. (2018). Developing a sustainability reporting assessment tool for higher education institutions: The University of California. *Sustainable Development*, *26*, 672–682. doi:10.1002/sd.1736.

Smith, T. B., Vacca, R., Mantegazza, L., & Capua, I. (2021). Natural language processing and network analysis provide novel insights on policy and scientific discourse around Sustainable Development Goals. *Scientific Reports*, *11*, 22427. doi:10.1038/s41598-021-01801-6.

Stolowy, H., & Paugam, L. (2018). The expansion of non-financial reporting: An exploratory study. *Accounting and Business Research*, *48*(5), 525–548. doi:10.1080/00014788.2018.1470141.

Szabó, D. G., & Sørensen, K. E. (2015). New EU Directive on the Disclosure of Non-Financial Information (CSR). *European Company and Financial Law Review*, *12*(3), 307–340. doi:10.1515/ecfr-2015-0307.

Tamimi, N., & Sebastianelli, R. (2017). Transparency among S&P 500 companies: An analysis of ESG disclosure scores. *Management Decision*, *55*(8), 1660–1680. doi:10.1108/MD-01-2017-0018.

Tarquinio, L., & Posadas, S. C. (2020). Exploring the term "non-financial information": An academics' view. *Meditari Accountancy Research*, *28*(5), 727–749. doi:10.1108/MEDAR-11-2019-0602.

Tsalis, T. A., Malamateniou, K. E., Koulouriotis, D., & Nikolaou, I. E. (2020). New challenges for corporate sustainability reporting: United Nations' 2030 Agenda for sustainable development and the sustainable development goals. *Corporate Social Responsibility and Environmental Management*, *27*, 1617–1629. doi:10.1002/csr.1910.

UN Global Compact & DNV GL (2020). *Uniting business in the decade of action. Building on 20 Years of Progress*. Retrieved from https://www.unglobalcompact.org/library/5747. Accessed June 24, 2021.

UN Global Compact. Network Spain (2020a). *Contribución de las empresas españolas a la estrategia de desarrollo sostenible 2030. Una consulta integral*. Retrieved from https://www.agenda2030.gob.es/recursos/docs/Consulta_empresarial_Pacto_Mundial.pdf. Accessed June 25, 2021.

UN Global Compact. Network Spain (2020b). *Comunicando el progreso 2019. Un análisis de los ODS y los diez principios en las empresas españolas*. Retrieved from https://www.pactomundial.org/wp-content/uploads/2020/01/Comunicando-el-Progreso-2019___.pdf. Accessed June 25, 2021.

Unerman, J., & Chapman, C. (2014). Academic contributions to enhancing accounting for sustainable development. *Accounting, Organizations and Society*, *39*(6), 385–394. doi:10.1016/j.aos.2014.07.003.

Political Watch (2021). *Escáner2030*. Retrieved from https://escaner2030.es/; https://github.com/politicalwatch/tipi-tasks/blob/master/tipi_tasks/tagger.py. Accessed June 24, 2021.

United Nations (n.d.). *We can end poverty. Millennium development goals and beyond* 2015. Retrieved from https://www.un.org/millenniumgoals/. Accessed June 24, 2021.

United Nations (2015). *Transforming our world: The 2030 agenda for sustainable development. Resolution adopted by the General Assembly on 25 September 2015*. Retrieved from https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E. Accessed June 24, 2021.

van der Waal, J. W. H., & Thijssens, T. (2020). Corporate involvement in Sustainable Development Goals: Exploring the territory. *Journal of Cleaner Production*, *252*, 119625–119635. doi:10.1016/j.jclepro.2019.119625.

van Duuren, E., Plantinga, A., & Scholtens, B. (2016). ESG Integration and the Investment Management Process: Fundamental Investing Reinvented. *Journal of Business Ethics*, *138*, 525–533. doi:10.1007/s10551-015-2610-8.

Venturelli, A., Caputo, F., Cosma, S., Leopizzi, R., & Pizzi, S. (2017). Directive 2014/95/EU: Are Italian Companies Already Compliant? *Sustainability*, *9*(8), 1385–1403. doi:10.3390/su9081385.

WBCSD (2020). *SDG Essentials for Business*. Retrieved from https://www.wbcsd.org/Programs/People-and-Society/Sustainable-Development-Goals/SDG-Action-Policy/News/WBCSD-launches-new-SDG-learning-platform. Accessed June 19, 2021.

World Commission on Environment and Development (1987). *Our common future*. Retrieved from https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf. Accessed June 19, 2021.

Zanakis, S. H., Solomon, A., Wishart, N., & Dublish, S. (1998). Multi-attribute decision making: A simulation comparison of selection methods. *European Journal of Operational Research*, *107*(3), 507–529. doi:10.1016/S0377-2217(97)00147-1.

Zimmermann, S. (2019). Same but different: How and why banks approach sustainability. *Sustainability*, *11*(8), 2267–2286. doi:10.3390/su11082267.