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Bovea, MD.; Perez-Belis, V.; Torca-Adell, L.; Ibáñez-Forés, V. (2021). How do organisations graphically communicate their sustainability? An exploratory analysis based on corporate reports. *Sustainable Production and Consumption*. 28:300-314.  
<https://doi.org/10.1016/j.spc.2021.04.011>



The final publication is available at

<https://doi.org/10.1016/j.spc.2021.04.011>

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# HOW DO ORGANISATIONS GRAPHICALLY COMMUNICATE THEIR SUSTAINABILITY? AN EXPLORATORY ANALYSIS BASED ON CORPORATE REPORTS

María D Bovea<sup>1</sup>, Victoria Pérez-Belis<sup>2</sup>, Laura Torca-Adell<sup>1</sup>, Valeria Ibáñez-Forés<sup>1</sup>

<sup>1</sup> Department of Mechanical Engineering and Construction, Universitat Jaume I, Castellón, Spain

<sup>2</sup> Project Management, Innovation and Sustainability Research Center (PRINS), Universitat Politècnica de València, València, Spain

\*corresponding author: bovea@uji.es

## Abstract

Corporate reports containing non-financial information are the main tool that organisations can use to communicate information concerning their sustainability performance to their stakeholders. The use of graphic media to transmit this information is increasingly present in most of these reports, since people recognise and understand this information more quickly than information represented by text. However, there is not a consensus in the use of icons, colours or forms, etc. for that purpose.

The objective of this study is to analyse the way in which organisations are currently communicating sustainability information graphically, in order to identify the existence of common design patterns. To do so, the graphic information included in 80 corporate reports was analysed. A total of 997 icons were identified, grouped in 8 environmental indicators, 19 social indicators, 1 economic indicator and 4 stakeholders. In addition to the concept represented graphically, aspects such as the form of composition, border shape or colour, among others, were analysed. It was found that there is a clear lack of standardisation when communicating the sustainability performance graphically, and also a clear need for a family of icons that allow a direct and unequivocal association of the icon and the corresponding sustainability indicator. This would facilitate the effective and efficient communication of sustainable information through corporate reports.

**Keywords:** sustainability report, environmental performance, social performance, icon design, pictogram, graphical communication

## 1. Introduction

Directive 95/UE/2014 (European Commission, 2014) arose from the need to improve the dissemination of non-financial information by organisations, related to their social and environmental aspects. Its ultimate goal is to increase the transparency of organisations and make them more resilient and perform better, both financially and non-financially. The non-financial disclosure requirements apply on a mandatory basis for organisations with more than 500 employees, but are not mandatory for small and medium-sized enterprises (SMEs), whose resources may be more limited. However, many SMEs have voluntarily started to disseminate this information as well.

As for the environmental and social information to be disclosed, the same Directive specifies environmental issues related to energy use, greenhouse gas emissions, water consumption, etc., and social issues related to gender equality, safety and health in the workplace, social dialogue and with local communities, etc. In addition, it specifies information related to human rights and the fight against corruption and bribery. This information can be completed with the non-binding guidelines proposed by COM 4234 (2017).

Companies retain significant flexibility to disclose relevant information in the way that they consider most useful. In this respect, a variety of frameworks can be applied: Guidance on social responsibility (ISO 26000, 2010), Guiding Principles on Business and Human Rights (United Nations, 2011), Environmental Management and Auditing Systems (European Commission, 2009), the German Sustainability Code (2014) and its guide (German Council for Sustainable Development, 2014), Social Accountability 8000 (SA8000, 2014), Sustainable Development Goals (United Nations, 2015), OECD Guidelines for Multinational Enterprises (OECD, 2018, 2011), UN Global Compact Policy (COP, 2019, 2011), ISAE 3000 (2013), Accountability Principles Standard (AA1000APS, 2008), etc. However, corporate reports based on GRI-Global Report Initiative (GRI, 2015) represent the main framework applied by organisations to communicate clear standardised information related to their environmental, social and economic performance to all their stakeholders.

With this approach, several academic studies have analysed the factors that encourage corporations to publish non-financial reports: to publicize stronger social and environmental records to stakeholders (Mahoney et al., 2013), to follow the government signals (Marquis and Qian, 2014), to respond to the external scrutiny by stakeholders (Thorne et al., 2014), or for greenwashing (Wilson, 2013). Some other studies have been focused on analysing sustainability reports from different types of organisation, such as corporations (KPMG, 2017), non-profit organisations (Ott et al., 2016), small and medium-sized (Steinhofel et al., 2019) or public organisations (Adams et al., 2014; Domingues et al., 2017).

Getting stakeholders to read corporate non-financial reports is one of the biggest obstacles since companies continue to package their reporting in dense documents (Morin and Muruganathan, 2017). According to GRI (2015), in the short term, the format of reporting needs to evolve towards a tool that stakeholders can interact with and which supports decision makers. However, this information is still based on numbers, charts and tables, which makes it very dense to read. The use of graphic representations, such as icons, to visually transmit this information is a tool that organisations can use to effectively communicate sustainability performance and to maximise the engagement with audiences in the least possible time (Amfori, 2019). To date, there is no standardised system related to sustainability that allows this information to be communicated graphically, which would foster its understanding and comprehensibility. In addition, engagement with customers and stakeholders with sustainability is one of the principles currently highlighted by different European initiatives related to sustainability. This is the case, for example, of the European Green Deal (COM 640, 2019), which addresses environmental challenges and promotes the implementation of ambitious environment, climate and energy policies across the world. Another example is the Circular Economy (COM 98, 2020) which also empowers consumers and public buyers to select sustainable products and services, for which the use of sustainability labels/logos is proposed together with the establishment of minimum requirements for them. Thus, the effective communication of sustainable information may contribute to achieving two of the transversal principles of the European policies, these being the strengthening of citizens' knowledge and empowering them to act on environmental protection.

In this context, the aim of this study is to analyse the relevance of the use of visual language for effective communication in corporate reporting, and seeks to answer two main research questions: Q1. Do organisations currently communicate sustainability information graphically? Q2 Are there common design patterns for it? To answer both questions, this study is organised as follows. Section 2 shows literature review related to the aspects analysed in corporate reports and the use of icons and pictograms. Section 3 presents the methodology followed for analysing the current graphic communication related to sustainability aspects in non-financial information disclosure reports. Section 4 shows the results of the diagnosis. Finally, results are discussed and conclusions and future developments are proposed.

## 2. Literature review

As Figure 1 shows, the literature that focus on reviewing "Corporate Sustainability Reports" do so from different perspectives, both for a specific economic sector or in general, and for a specific country or worldwide. Asif et al. (2013) included a detailed overview of sustainability reporting literature until 2010. In the last decade, the reviews included in Figure 1 can be highlighted at international level. Morali and Searcy (2013) analysed the reports from 100 Canadian firms from the perspective of their practices on sustainable supply chain management. Asif et al. (2013) reviewed 33 reports included in the GRI Database (2010) belonging to Dutch firms, in order to analyse their sustainable development reporting patterns. Wan Ahmad et al. (2016) and Gaudencio et al. (2020) analysed sustainability reports of the oil and gas industrial sector. The first authors analysed the 2015 reports of four companies located in Brazil in order to identify gaps in the information disclosed, while the second authors analysed the reports of 30 oil and gas companies worldwide between 2009 and 2011, in order to compare the level of sustainability for their supply chains. Usher and Maroun (2018) analysed the biodiversity-related content in 90 reports (2013 and 2014) from companies belonging to the seafood sector in South Africa. Two other reviews analysed the incorporation of aspects of circular economy in sustainability reports: Sihvonen and Partanen (2017) in 43 sustainability reports belonging to the ICT sector, while Stewart and Niero (2018) did the same in reports belonging to 46 companies in the fast moving consumer goods sector. As regards indicators included in corporate reports, Papoutsis and Sodhi (2020) analysed the indicators of 331 reports belonging to firms in the GRI database between 2013-2014, while Solikhah et al. (2021) analysed the indicator related to carbon emissions used in a sample of 40 manufacturing companies listed on the Indonesia Stock Exchange between 2012 and 2015. Finally, other reviews were focused on the content analysis: Bouten et al. (2011) assessed the comprehensiveness of 108 reports belonging to Belgian firms, Mio (2010) examined the maturity level of 12 reports belonging to Italian utility firms, Davis and Searcy (2010) explored the content related to eight areas in 87 GRI reports belonging to Canadian firms, and Landrum and Ohsowski (2018) studied the keywords that appeared in 108 GRI and 122 non-GRI sustainability reports.

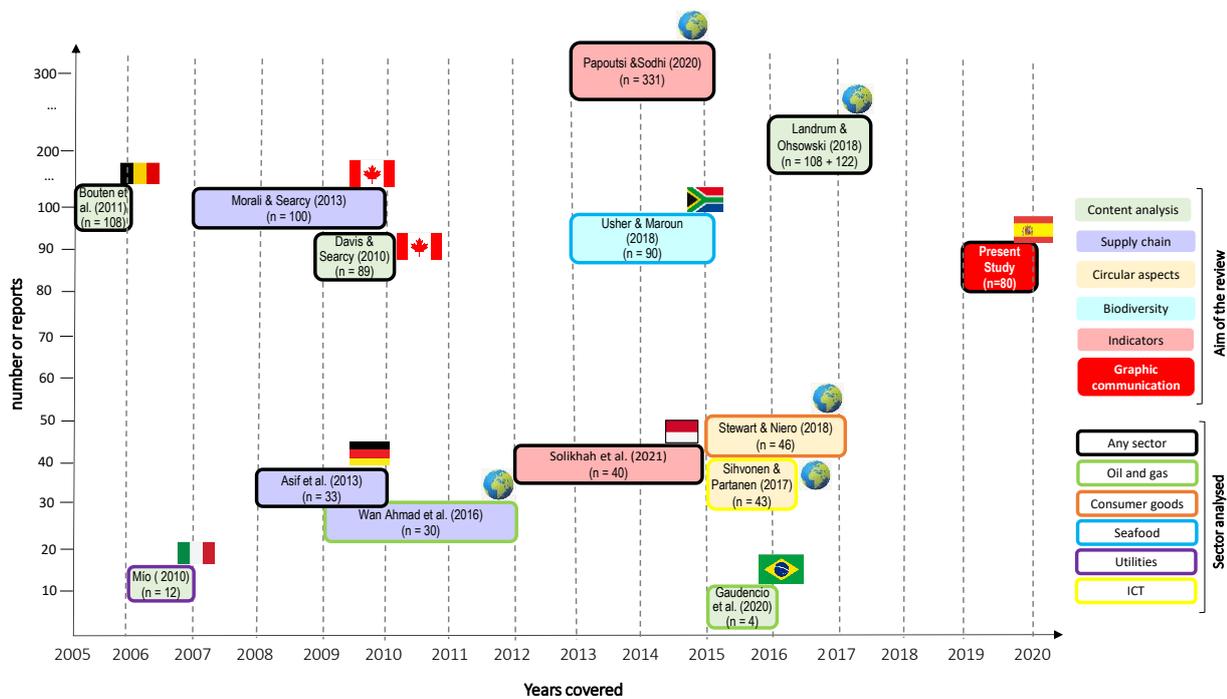


Figure 1. Aims and sectors covered by reviews focused on corporate reports, over time

Other literature focused on reviewing aspects related to corporate non-financial reports was mainly dedicated to offering guidance on good practices and to providing a basis for improvement (KPMG, 2017). In this line, Davis and Searcy (2010) identified areas for further research and Gürtürk and Hahn (2016) evaluated differences and similarities between assurance statements used in different corporate reports. More recently, Di Vaio et al. (2020) and Traxler et al. (2020) analysed the role of human resources and the importance of management control systems, respectively, in corporate reports. As can be seen, none of these reviews or studies were focused on analysing the aspects of graphic communication in corporate/sustainability reports. In addition, none of them were applied to the specific case of Spanish companies.

Related to graphic communication, icons are generally used as a means of visual communication. According to Barstow et al. (2019), an icon is a visual interface with a certain meaning that represents or substitutes an idea by analogy or symbolically, which allows it to transmit information quickly and be recalled without effort. Icons have a symbolic meaning or connotation behind them, by representing a larger system through an object in a simplified, pictorial manner (Wiedenbeck, 1999). They are also more convenient for universal communication than text, since language interpretation is not an obstacle (McDougall et al., 1999). In addition, people recognise and understand information represented by icons more quickly than information represented by text (Chung et al., 2011; Ma et al., 2015). At the same time, they also allow for better visualisation, since they can be identified twice as far away as written text and in half the time (Punchoojit and Hongwarittorn, 2018).

Table 1 reports studies published over the last decade and focused on analysing visual language communication by means of icons or pictograms. All these studies were mainly focused on assessing the comprehensibility of the graphic information (how well a graphic element communicates what it is intended to represent to the user), guessability (quality of graphic information that allows a user to access intended referents despite a lack of knowledge of this graphic information), readability (how users process the information in the content), meaningfulness and recognition (identifying the graphic information with the previous knowledge acquired), semantic distance (the closeness of the relationship between the objects depicted in the icon and the function being represented), and user perception (process by which consumers sense a stimulus and organise, interpret and provide it with meaning). The way in which users receive and perceive graphic information is decisive in communication processes, especially those based on surveys or questionnaires.

As can be seen in Table 1, the use of icons is a general practice applicable to different sectors. Regarding health and safety, Ahmadi et al. (2021) and Lin et al. (2020) investigated the comprehensibility of pharmaceutical pictograms, Chan and Chan (2011) and Hiranchiracheep et al. (2016) focused on the understanding of industrial safety and emergency signs, while Boelhouwer et al. (2013) analysed hazard and precautionary pictograms on product labels. Icons or pictograms in environments that require orientation should also be designed so as to be fully understood by consumers, regardless of age, origin or visual disability. In this context, Boisadan et al. (2020) analysed icons for orientation maps and

Keil et al. (2019) did the same for landmarks. With respect to the automotive sector, Roca et al. (2018) and Chi and Dewi (2014) compared the legibility and performance, respectively, of message signs for drivers given by text and by icons, while Johann and Mahr (2011) proposed an icon selection test for the automotive domain based on the usability criteria and Silvennoinen et al. (2017) analysed the icons for in-car infotainment systems. In addition, the development of technology and digital communication has led the study of graphical user interfaces, allowing users to interact with electronic devices through graphical icons or pictograms. Different studies have focused on the electronic sector: Chiu et al. (2012) focused on the readability of icons for websites or computer software for children, Gatsou et al. (2012b) examined the importance of mobile interface icons on user interaction, Ghayas et al. (2013) and Leung et al. (2011) explored the effects of icon characteristics on mobile phone users' perception, Huang et al. (2019) looked at the usability of icons in automatic teller machines and Rahrovani et al. (2018) investigated the concreteness of searching module icons in digital libraries. Finally, Bovea et al. (2018) analysed and designed icons applicable to the labelling of products that satisfy requirements related to the circular economy.

The literature specifically focused on the analysis of the graphical content of corporate reports is very limited. Cho et al. (2012) investigated whether firms manipulate the use of graphs in their non-financial reports in order to present a more favourable view of their social and environmental performance. Chong et al. (2019) uncovered the extent of the utilisation of photographs depicting corporate social responsibility information in corporate annual reports and the possible motives for their use. They analysed photographs included in 70 annual reports in 2005, 2010 and 2015. Kanbaty et al. (2020) examined the use of infographics in 147 US sustainability reports, focusing particularly on whether infographics are used for impression management purposes by creating a more favourable view of a firm's sustainability performance. This graphical content was only been analysed in corporate reports from USA (Cho et al., 2012; Kanbaty et al., 2020) and New Zealand (Chong et al., 2019). Litfin et al., (2017) developed a pilot study of a combined eye-tracking and survey approach for the analysis of search and information browsing behaviour in various types of sustainability reports, by examining the visual of readers.

Therefore, it is clear that there is a research gap in this context, and that it is necessary to analyse the way in which organisations graphically communicate their environmental and social behaviour, etc., through the use of icons.

**Table 1.** Review of studies focused on analysing icons/pictograms from last ten years.

Reference	Sector								Country	Objective						Method	Sample size for evaluating icons/pictograms	N° of analysed concepts	N° of icons/pictograms by concept	Total of icons/pictograms analysed
	Automotive	Circular products	Emergency/safety	Farmer activities	General icons (no specific sector)	User interface in electronic devices	Lining- bath-room functions	Orientation		Pharmacy	Comprehensibility	Guessability	Readability	Meaningfulness and recognition	Semantic distance					
(Ahmadi et al., 2021a)								•	Iran	•	•			•	Questionnaire (meaning and rating scale)	351 (mainly women)	21	1	21	
(Boelhouwer et al., 2013)			•						United States	•					Survey (selection)	133 (88 naïve users + 45 experts) 40 males + 93 females	16	2	16	
(Boisadan et al., 2020)							•		France	•					Survey (ranking-open-ended-yes/no)	327 (297 adults, 30 children)	19	1-4	24	
(Bovea et al., 2018)		•							Spain	•					Survey (selection)	400 people (representative population)	5	5	25	
(Chan and Chan, 2011)			•						Hong Kong	•					Survey (comprehension scores)	92 (85 males + 7 females)	30	1	30	
(Chi and Dewi, 2014)	•								Taiwan	•					Survey	40 (20 males + 20 females)	-	-	82	
(Chi et al., 2019)						•			Taiwan	•					Survey (ranking)	13 students	9	7	63	
(Chiu et al., 2012)					•				Taiwan		•				Tasks and listed questions (selection)	35 (19 kindergartners and 16 1st graders)	-	1	22	
(Gatsou et al., 2012)					•				Greece				•		Paper-based icon recognition questionnaire (select.)	60 (32 males + 28 females)	8	4-9	54	
(Ghayas et al., 2013)					•				Malaysia	•		•	•	•	Experiment (interpretation of icons)	30 (15 younger adults + 15 older adults)	20	1	40	
(Hiranchiracheep et al., 2016)			•						Thailand					•	Survey (selection)	138 staff members at a factory (68+70)	3	7	21	
(Huang et al., 2010)					•				Taiwan					•	Experiment with computer	17 graduate students*	-	-	30	
(Huang et al., 2019)					•				China						Simulated touch screen*	124 (62 males+62 females) elderly people	28	1	28	
(Johann and Mahr, 2011)	•								Germany	•					Survey (ranking)	24 (12 males + 12 females)	18	3	54	
(Keil et al., 2019)							•		Germany			•			Survey recognition (yes/no) and eye-tracking analysis	28 students (18 males + 10 females)*	153	1	153	
(Kisaalita and Sempira, 2020)			•						Uganda	•					Survey (meaning)	40 (20 males + 20 females)	20	1	20	
(Leung et al., 2011)					•				Canada					•	Mobile phone	36 (18 males + 18 female)	-	-	60	
(Lin et al., 2020)							•		United States	•				•	Online survey (meaning)	108 older adults (56.5% females)*	15	1	15	
(Rahrovani et al., 2018)					•				Iran	•					Expert group (classification)	15 professors	25	1-4	33	
(Roca et al., 2018)	•								Spain	•					Simulated driving session and an eye-tracking device	44 (8 males + 32 females)	6	1	6	
(Silvennoinen et al., 2017)	•								Finland				•		Experiments-display (preference rankings)	21 students (11 males + 10 females)	19		19	

\*paid participation

### 3. Methods

With a view to analysing the icons used in corporate reports drawn up by organisations to communicate their non-financial information, the methodology shown in Figure 2 was proposed, the stages of which are described below.

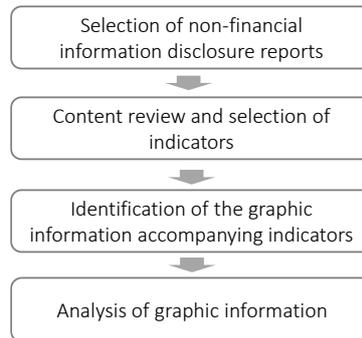


Figure 2. Methodology

#### Stage I: Selection of non-financial information disclosure reports

Corporate reports containing non-financial information have been given different names, such as *Non-financial information report*, *Annual report*, *Integrated corporate report*, *Sustainable development report*, *Corporate responsibility report*, *Sustainability report*, *Corporate responsibility or Sustainability report*. Of all the terms used *Sustainability report* is the most common (Davis and Searcy, 2010).

The corporate reports to be analysed can be selected in several different ways, although the most recommendable is to use specific corporate report databases. There are a number of such databases, some at the international level, such as Sustainability Disclosure Database (GRI Database, 2020), Corporate Register (2020) or Online Reports Database (2020), and others at the national level, which are available through government centres.

#### Stage II: Content review and selection of indicators

Directive 95/EU/2014 (European Commission, 2014) specifies environmental issues related to energy use, greenhouse gas emissions, water consumption, etc., and social issues related to gender equality, safety and health in the workplace, social dialogue and with local communities, etc. In addition, it specifies information related to human rights and the fight against corruption and bribery. This information can be completed with the non-binding guidelines proposed by COM 4234 (2017):

- Environmental matters, related to: material disclosures on pollution prevention and control, environmental impact from energy use, direct and indirect atmospheric emissions, use and protection of natural resources (e.g. water, land) and related protection of biodiversity, waste management, environmental impacts from transportation or from the use and disposal of products and services, and development of green products and services.
- Social and employee matters, related to: implementation of the fundamental conventions of the International Labour Organisation, diversity issues (including gender diversity and equal treatment in employment and occupation, such as age, gender, sexual orientation, religion, disability, ethnic origin and other relevant aspects), employment issues (including employee consultation and/or participation, employment and working conditions), trade union relationships (including respect for trade union rights), human capital management (including management of restructuring, career management and employability, remuneration system or training), safety and health at work, consumer relations (including consumer satisfaction, accessibility, products with possible effects on consumers' safety and health), impacts on vulnerable consumers, responsible marketing and research, and community relations (including social and economic development of local communities).
- Respect for human rights, related to the rights of children, women, indigenous people, persons with disabilities, local communities, smallholder farmers, victims of trafficking in human beings; and the rights of workers, including those working under temporary contracts, workers in supply chains or sub-contractors, migrant workers, and their families.
- Anti-corruption and bribery matters, related to how they assess fighting corruption and bribery, take action to prevent or mitigate adverse impacts, monitor effectiveness, and communicate on the matter both internally and externally.
- Others, such as supply chains or conflict minerals.

After a first screening of the non-financial corporate reports, the indicators, for which organisations provide both quantitative and qualitative information, should be identified taking these guidelines as a reference.

**Stage III: Identification and classification of the graphic information accompanying indicators**

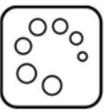
Once the indicators have been selected, a second and more in-depth review of the reports is carried out to select the icons used in them to graphically represent each indicator. The icons identified for each indicator then need to be classified according to the concept they represent.

**Stage IV: Analysis of graphic information**

Once the different icons used to represent each indicator have been identified, it is recommendable to analyse different aspects, for example:

- What the specific characteristics of the icon are, since they can influence the way it is perceived by the audience:
  - . Form of composition. According to Wong (1993), the different forms of composition of the icons may produce different visual effects, depending on whether this composition is based on lines or planes. Line-based icons rely on these to generate contour shapes, while plane-based icons are solid composite figures (Sanders and McCormick, 1992). According to Easterby (1970), plane-based icons are perceived better than line-based icons. See Table 2.
  - . Border shape. Another of the elements analysed in the literature is the border of the icon, that is, whether or not it has a border (Cao et al., 2020) or the geometric shape that surrounds the icon (Cao et al., 2020; Chen, 2015; Huang and Chiu, 2007; Lin et al., 2017). These two aspects can significantly attract users' attention and guide their gaze towards the icon. See Table 2.
  - . Colour. It is perceived early and automatically in the processing of information, allowing some icons to stand out from others (Ng and Chan, 2008). It is the icon characteristic that has been analysed the most in the literature (Bzostek and Wogalter, 1999; Cui et al., 2020; Huang, 2008; Shieh and Ko, 2005; etc.).

**Table 2.** Example of characteristics in icons

<b>Form of composition</b>	 lines	 planes	
<b>Border shape</b>	 without	 square	 round

- Whether the icon was designed by or for the company or if it belongs to a public or commercial icon database. Supplementary material includes a non-exhaustive list of databases (Table S1).

**4 Results**

**4.1 Stage I: Selection of non-financial information disclosure reports**

Several different routes can be followed to select the corporate reports required for the analysis, although the most recommendable is to use a database like the Sustainability Disclosure Database (GRI Database, 2020). This database is a comprehensive repository of non-financial information disclosure reports, whether GRI-based or not, that organisations make available to interested parties on a voluntary and free basis.

To carry out this study, reports were selected in the Sustainability Disclosure Database (GRI Database, 2020) using the following selection criteria: Spanish organisations, year of the report 2018 (published in 2019), any sector, any size and any type of report. With these restrictions, 80 reports drawn up by Spanish organisations belonging to the sectors reported in Figure 3 were obtained and analysed. 58% of the reports belong to large enterprises, while of the others 17% and 25% belong to multinational enterprises (MNE) and small and medium enterprises (SME), respectively. In addition, 41% of the reports were Sustainability Reports, while 26% were Corporate Responsibility Reports. The remaining ones were mainly Annual Reports (17%) or Integrated Reports (10%).

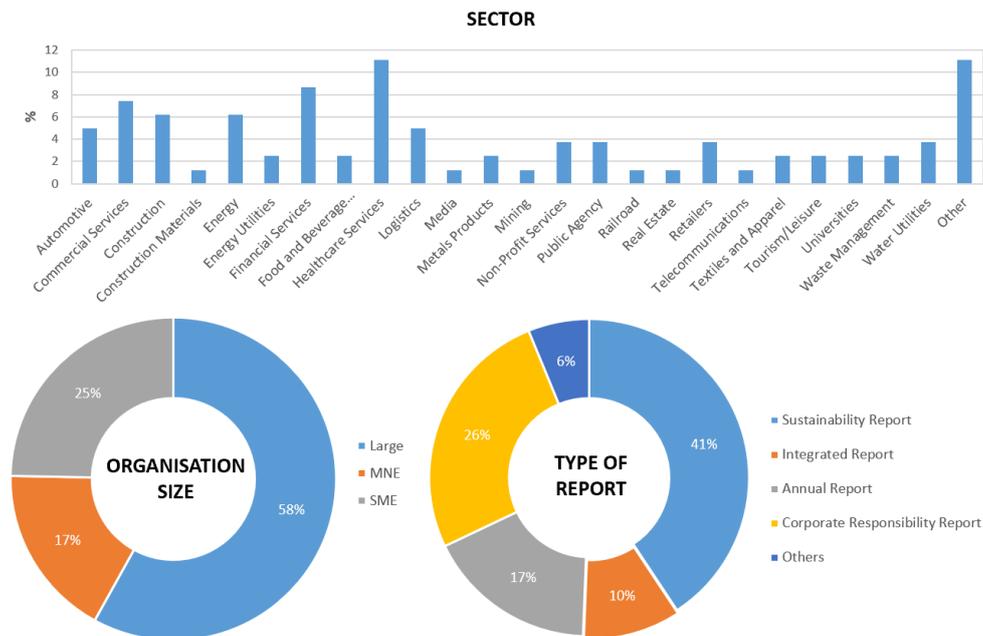


Figure 3. Sector, organisation size and type of report

#### 4.2 Stage II: Content review and selection of indicators

Although the Directive does not specifically indicate the indicators to be communicated related to the environmental, social or economic performance of organisations, COM 4234 (2017) does offer non-binding guidelines in order to ensure comparability between organisations and sectors.

After a first screening of the 80 non-financial information disclosure reports selected, the indicators that are accompanied by graphic information (icons) were identified and compared to the list of indicators recommended by COM 4234 (2017). After this process, the indicators reported in Figure 4 were selected. The Stakeholders category has been added, since it is included in most of the reports.

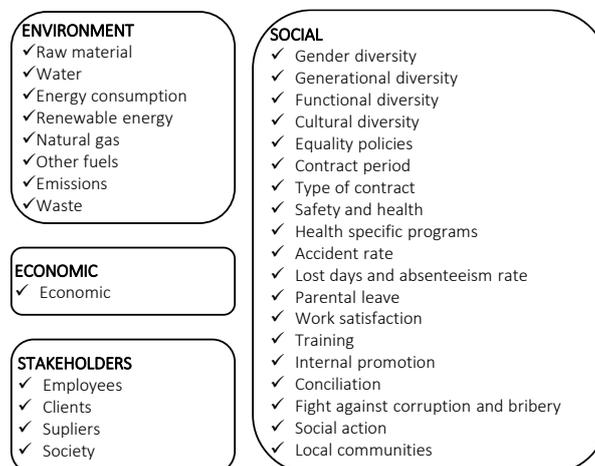
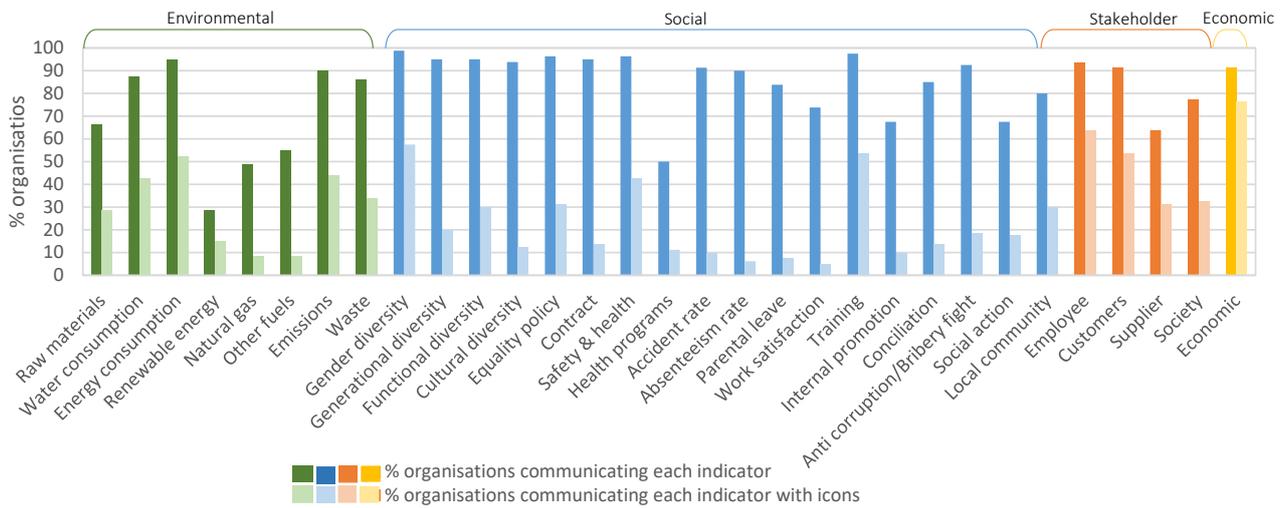


Figure 4: Indicators considered for each category

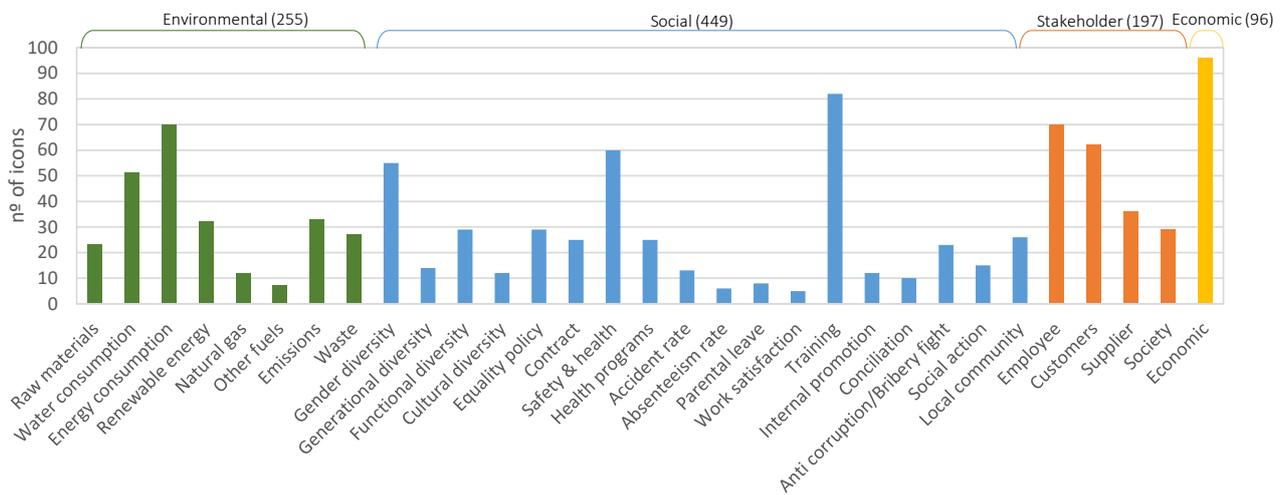
#### 4. 3. Stage III. Identification and classification of the graphic information accompanying indicators

Once the indicators had been selected, a second screening was carried in order to identify, for each non-financial information disclosure report, whether each indicator was considered and, if so, whether an icon was used to graphically represent it. Figure 5 shows the results.



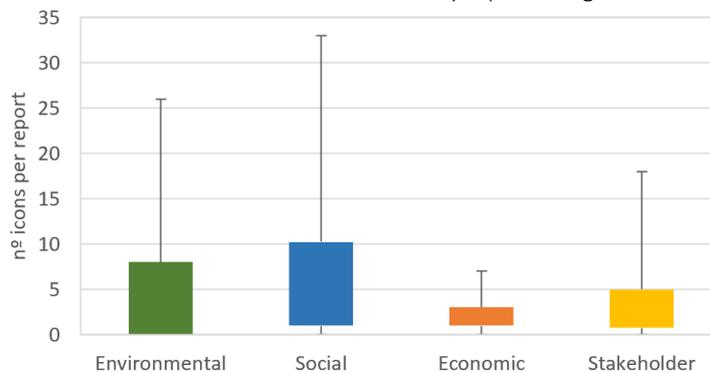
**Figure 5.** Percentage of organisations communicating each indicator and percentage using icons to do so

A total of 997 icons were identified, distributed, as shown in Figure 6 among the environmental (25.6%), social (45.0%), economic (9.6%) and stakeholders (19.8%) categories.



**Figure 6.** Distribution of the number of icons by indicator and aspect

The number of icons used per report is quite variable, as Figure 7 displays for each aspect (environmental, social, economic and stakeholder) by means of a boxplot. In addition, 61.3% of the reports use icons belonging to the same family (icons with the same graphic style). The number of icons used in those reports with icons belonging to a family is significantly higher than in those whose icons do not have a similar style (on average 20.7 and 7.3 per report, respectively).



**Figure 7.** Distribution of the number of icons per report

Tables in the Supplementary Material show the icons for each indicator (Tables S2-S5), while Tables 3-6 classify them according to the concept used to represent each indicator. The rows in the tables show the concepts that were used

more often as the first option, second option, third option and others for each indicator. Additionally, for each option, the times that each concept is used to represent the indicator are also shown as a percentage. In the event that different varieties of a same concept are used, the percentage of the times that each variety is used is also reported in the same cell.

For example, to represent the indicator "Water", the concept "drop" is used 49% of the times, the concept "tap" is used 33% of the times and the concept "hand" is used 6% of the times. In addition, three varieties of the concept "drop" are used: one empty drop (25%), a drop with the Möbius circle inside it (14%) and more than one empty drop (10%). Hence, the concept "drop" is the preferred first option to represent the indicator "Water", "tap" is the second preferred option and "hand" is the third preferred option, due to the number of times that each concept is used. The column "Other options" groups other concepts used less than the number of times used in the third option. However, if a concept is used only once, it is added to the group "Others" as well as in the column "Other options". In the case of the indicator "water", other concepts apart from "drop", "tap" and "hand" are used only once, and they represent 12% of all the cases.

**Table 3.** Classifications of icons belonging to the environment category

	1 <sup>st</sup> Option (%)	2 <sup>nd</sup> Option (%)	3 <sup>rd</sup> Option (%)	Other options
<b>Raw materials</b>	Factory (17%)	Load (13%) <i>container (4%) truck (4%) wheelbarrow (4%)</i>	Box (9%) Bag (9%) Wood log (9%)	Others (43%) <i>(laboratory, rope, mineral, sheet, leaf, fish, gear, hands, petroleum, pallet)</i>
<b>Water</b>	Drop (49%) <i>one "empty" drop (25%) drop with möbius circle (14%) more than one "empty" drop (10%)</i>	Tap (33%)	Hand with drop (6%)	Others (12%) <i>(world with drop, sanitation network, leaves, underground, gear, reservoir)</i>
<b>Energy consumption</b>	Light bulb (36%)	Plug (17%)	Lighting (14%)	Arrows (9%) Electricity tower (6%) Cross (4%) Diagram (3%) Others (11%) <i>(people, switch, car, cooking pot, petroleum, house, industry, statistics)</i>
<b>Renewable energy</b>	Wind turbine (28%)	Solar panel (22%)	Solar thermal (13%)	Wave (10%) Sun (10%) Industry (7%) Others (13%) <i>(lightning + drop, battery, leaf, wind)</i>
<b>Natural gas</b>	Fire flame (58%)	Gas tap (17%)		Others (25%) <i>(circle, building, gas cylinder)</i>
<b>Other fuels</b>	Fuel pump (43%)			Others (57%) <i>(wheelbarrow, industry, diesel drum, particles)</i>
<b>Emissions</b>	Cloud (63%) <i>without CO<sub>2</sub> (36%) empty (27%)</i>	Industry (12%)	World (9%)	Arrows (6%) Footprint (6%) Others (3%) <i>(trees)</i>
<b>Waste</b>	Bin (48%) <i>without logo (33%) with Möbius logo (15%)</i>	Arrows (30%)	Truck (11%)	Others (11%) <i>(light bulb, printer, medicine)</i>

**Table 4.** Classifications of icons belonging to the social category

	1 <sup>st</sup> Option (%)	2 <sup>nd</sup> Option (%)	3 <sup>rd</sup> Option (%)	Other options
<b>Gender diversity</b>	Man & woman silhouettes (76%) whole body (38%) torso (36%) integrated in one single silhouette (2%)	Gender symbols (18%) both symbols (13%) integrated in a single symbol (5%)		Others (5%) (LGBT flag, circle with initials (GD), three people)
<b>Generational diversity</b>	People (93%) group (27%) two (27%) one (39%)	Calendar (7%)		
<b>Functional diversity</b>	People (50%) whole body (21%) wheelchair (14%) person at a desk (11%) walking stick (4%)	Hands in contact (14%)	Puzzle (10%)	Diagram (7%) Others (18%) (pipettes, head, world, paper & pen, paper with scale)
<b>Cultural diversity</b>	People (50%) colour (25%) group (25%)	World (33%)		Others (17%) (scale, heart)
<b>Equality policies</b>	Woman (38%) whole body (14%) torso (24%)	Man/Woman (24%) Silhouette (22%) Hands (2%)	Gender symbol (17%) female (7%) female = male (10%)	Others (21%) (award, people, hands in contact, briefcase, envelope, chair)
<b>Contract period</b>	Analogue clock (86%) full time (43%) part time 2 (29%) temporal 1 (14%)	Hourglass (14%)		
<b>Type of contract</b>	Paper (61%) paper + person (28%) paper + tick (17%) paper + infinity (11%) paper + analogue clock (5%)	Award (11%)		Others (28%) (magnifying glass + person, person + tick, one person, two people, three people)
<b>Safety and health</b>	Heart (21%) with electrocardiogram (15%) alone (7%)	Personal protective equipment (17%) helmet (8%) hearing protection (2%)	Cross (10%) briefcase (5%) paper (3%) person (2%)	Endoscope (8%) Hands (8%) Medicine (7%) Health check (5%) Padlock (5%) People (5%) Warning sign (3%) electrocardiogram (2%) Others (8%) (lifebelt, soap, head, rule, magnifying glass)
<b>Health programmes</b>	Feeding (36%) apple (20%) drink (8%) meat (4%) vegetable (4%)	Sport (20%) person (8%) gym weights (4%) trainers 1 (4%) analogue clock (4%)	Health check (20%) eye (8%) injection (4%) ear (4%) back (4%)	Scale (8%) Emotional health (8%) Others (8%) (hand + heart, two people)
<b>Accident rate</b>	People (31%)	Warning sign (15%) Bed (15%)		Others (38%) (fall, wounded, cross, paper, diagram)
<b>Lost days and absenteeism rate</b>	Calendar (33%) People (33%)			Others (33%) (briefcase, paper and pen)
<b>Parental leave</b>	Silhouette (50%) couple (25%) family (25%)	Cot / pram (25%)	Medical aspect (25%)	
<b>Work satisfaction</b>	Stars (40%)	Hands (40%) caring hands (20%) hands in contact (20%)	Award (20%)	
<b>Training</b>	People (22%) who teach (10%) who learn (6%) without action (5%)	Clock (19%) analogue clock (11%) analogue clock + person (5%) hourglass (1%) analogue clock + paper (1%)	Graduation cap (14%)	Book (10%) Computer screen (5%) Projector screen (4%) Pencil (6%) Award (6%) Paper (5%) Others (9%) (light bulb, calendar, briefcase, house, tower, speaker, hand)
<b>Internal promotion</b>	People (42%) three (17%) two (17%) one (8%)	Stairs and podium (33%)	Diagram (17%)	Others (8%) (world + computer)
<b>Conciliation</b>	Analogue clock (30%) alone (20%) with paper (10%)	Family (20%)	Hands in contact (20%)	Others (30%) (two people, person + desk, calendar)
<b>Fight against corruption and bribery</b>	Magnifying glass (30%)	Hands in contact (17%)	Scale (13%)	Justice buildings (9%) Tick (9%) Others (22%) (diagram, two heads, divider bar, speech bubbles, light bulb)
<b>Social action</b>	Hands (34%) caring hands (7%) one hand (7%) hands in contact (7%) several hands (7%) several hands in contact (7%)	People (20%)	World (13%)	Others (33%) (speech bubbles, eye, wire, bag, analogue clock)
<b>Local communities</b>	People (31%) two (8%) three (12%) more than three (12%)	Hands (27%) hands in contact (12%) one hand (8%) two hands (4%) caring hands (4%)	Houses (15%) Locator icon (15%)	Others (12%) (training, speech bubbles, building)

**Table 5.** Classifications of icons belonging to the economic category

	1 <sup>st</sup> Option (%)	2 <sup>nd</sup> Option (%)	3 <sup>rd</sup> Option (%)	Other options
<b>Economic</b>	Money (50%) <i>coins (25%) euro symbol (18%) banknotes (7%)</i>	Hands with money (10%) <i>one hand + coins (7%) one hand + banknotes (3%)</i>	Statistics (26%) <i>bars (18%) line (5%) sector (3%)</i>	Document (4%) Piggy bank (2%) Others (7%) <i>(arrow, world, gears, justice building, calculator, tie, abacus)</i>

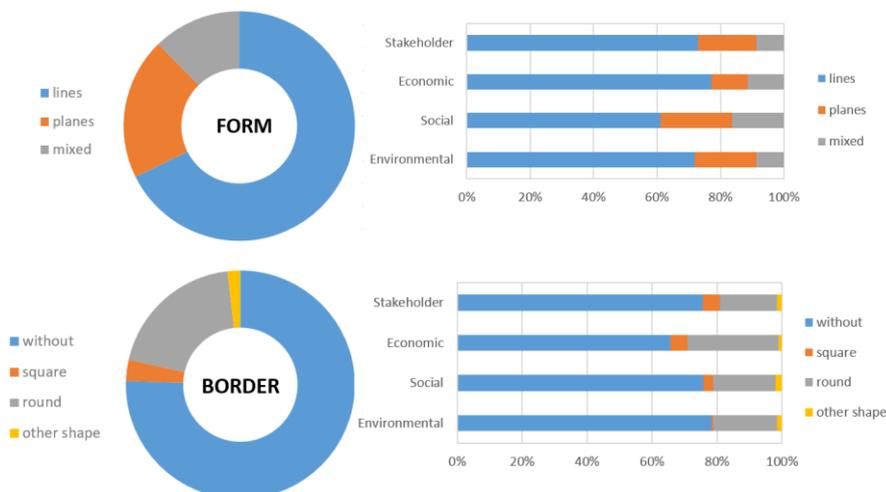
**Table 6.** Classifications of icons belonging to the stakeholders category

	1 <sup>st</sup> Option (%)	2 <sup>nd</sup> Option (%)	3 <sup>rd</sup> Option (%)	Other options
<b>Employee</b>	People (84%) <i>one (23%) two (21%) three (27%) group (13%)</i>	Staff organisation chart (10%)	Hands (4%) <i>caring hands (1%) one hand (1%) several hands in contact (1%)</i>	Others (1%) (building)
<b>Customer</b>	People (58%) <i>one (15%) two (16%) three (15%) group (13%)</i>	Hands (19%) <i>hands in contact (10%) thumb up (8%) one hand (2%)</i>	Satisfaction (8%)	Medal (7%) Others (8%) <i>(tick, drop, screen, speech bubbles, world)</i>
<b>Supplier</b>	Transport (31%) <i>wheelbarrow (17%) truck (14%)</i>	People (25%) <i>three (14%) one (5%) two (3%)</i>	Hands in contact (17%)	Documents (8%) Warehouse (6%) Others (14%) <i>(star, gear, ship, Spain, suitcase)</i>
<b>Society</b>	People (72%) <i>three (31%) diagram (17%) two (14%) group (10%)</i>	World (10%)	Houses (14%)	Others (3%) <i>(several hands in contact)</i>

#### 4.4 Stage IV: Analysis of graphic information

As indicated in the methodology, the graphic characteristics of icons are analysed based on the form of composition, border shape and colour. Figure 8 shows the results of the analysis. No significant differences appear in the characteristics of icons for each aspect analysed (environmental, social, economic and stakeholders), which is why the graphic characteristics of the icons are presented in aggregate form for all of them.

Regarding the form of composition, on average, 68% of the icons are based on lines, while only 20% are composed of planes. The remaining 12% are a mixture of the two. Regarding the border, 75% of the icons have no border compared to 25% which do have one. Of the latter, a rounded border is preferred in 20% of the icons, while a square border is used in 3% of them. Other shapes are only used in 2% of the icons. Finally, regarding the colour, 86% of the icons are coloured, the most used colours being, in order of frequency, blue, green, orange, red and purple. The black and white option appears in 14% of the icons.



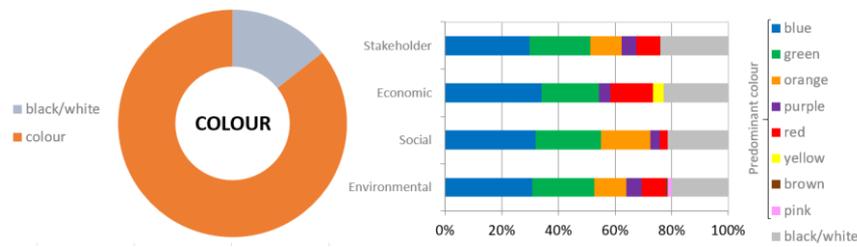


Figure 8. Analysis of graphic characteristics of icons

The use of icons designed by or for the company is generalised, as shown in Figure 9, since only 13.1% of icons were identified as belonging to public databases (see Table S1 in the Supplementary material). It is also worth highlighting that there are also cases of the use of icons belonging to a family designed for some other or a related purpose. This is the case of the icon family designed by the Trollbäck Company (2020) to graphically represent the Sustainable Development Goals (SDGs) (United Nations, 2015). It has been found that 3% of the icons analysed were icons representing SDGs. These icons were mainly used to represent indicators related to:

- Environmental performance: water (SDG #6 – Clear water and sanitation) and emissions (SDG #13 – Climate action).
- Social performance: equality policies (SDG #5 – Gender equality), health & safety (SDG #3 - Good health and well-being), training (SDG #4 – Quality education), and social action (SDG #3, SDG #4, SDG #8 – Decent work and economic growth, and SDG #17 – Partnership for the goals).
- Economic (SDG #8).
- Stakeholders (SDG #5, SDG #8, SDG #10 Reduced inequalities, and SDG #16 Peace, justice and strong institutions).

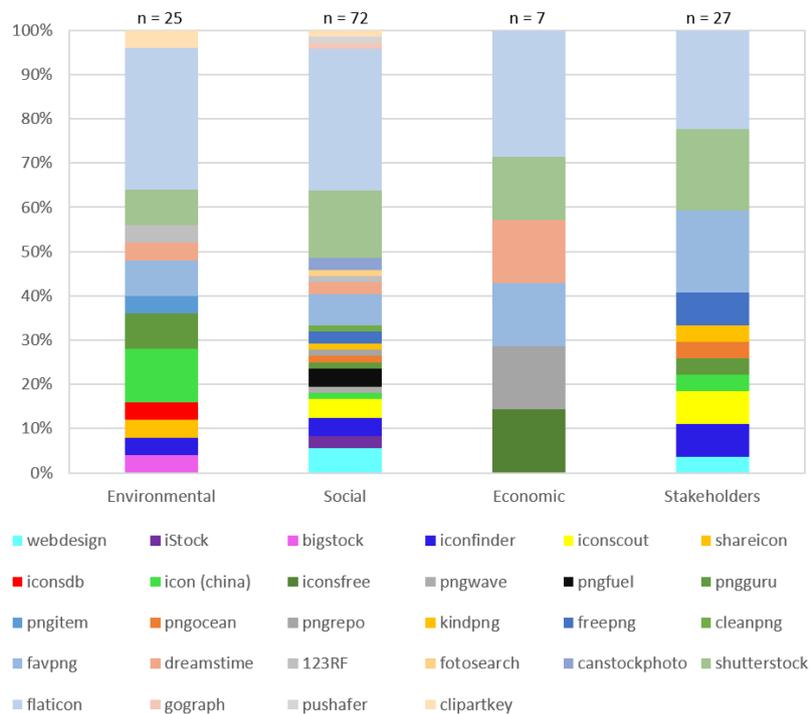


Figure 9. Icons belonging to databases, by aspect

Finally, it is also important to remark that some of the icons found represent a wide variety of indicators, as Table 7 reports. This creates confusion when interpreting each indicator, and in isolation it is difficult to associate and interpret the indicator from the icon.

**Table 7.** Icons representing different indicators

Icon concept	Indicators		
People / Group of people	Accident rate Conciliation Contract Cultural diversity Customers Employees Functional diversity	Gender diversity Generational diversity Health programs Internal promotion Local communities Lost days and absenteeism rate	Equality policies Parental leave Providers Social action Society Training
Hand	Conciliation Cultural diversity Customers Economic Employees	Equality policies Fight against corruption and bribery Functional diversity Local communities Providers	Safety and health Social action Society Water Work satisfaction
Calendar	Generational diversity Lost days and absenteeism rate	Training	Conciliation
Analogue clock	Contract	Conciliation	Training
Diagram	Functional diversity Accident rate Internal promotion	Fight against corruption and bribery Energy consumption Local communities	Employees customers Society
Scale	Functional diversity	Fight against corruption and bribery	Cultural diversity
World	Functional diversity Cultural diversity Internal promotion	Social action Local communities Customers	Society Emissions Economic
Gender symbols	Gender diversity	Equality policies	
Awards	Equality policies Contract	Training customers	Work satisfaction
Heart	Cultural diversity	Safety and health	
Briefcase	Equality policies Lost days and absenteeism rate	Training Social action	Customers
Magnifying glass	Contract Safety and health	Fight against corruption and bribery	Economic
Cross	Accident rate Safety and health	Parental leave	Energy consumption
Tick	Safety and health	Fight against corruption and bribery	Customers
Helmet	Safety and health	Employees	Accident rate
Warning sign	Safety and health	Accident rate	
Emoticon	Health programmes	Customers	
Paper + object	Lost days and absenteeism rate Accident rate Safety and health	Training Customers Providers	Economic Contract Functional diversity
Truck	Providers	Raw materials	Waste
Wheelbarrow	Other fuels	Raw materials	Supplier
Industry	Energy consumption Renewable energy	Emissions Society	Diesel Raw materials

## 5. Discussion

The results of this study show that an increasing number of icons, infographics and graphic elements are being included in non-financial information disclosure reports, which until recently were limited to presenting a large amount of data and information that was dense and difficult to understand. From the results obtained, it can be seen that a wide variety of icons (both in form and number) are used to graphically represent environmental, social and economic performance and the relationship with different stakeholders. However, unlike what happens with other sectors or specific fields (safety, security, pharmacy and orientation, for example), there is no consensus or previous research that makes it possible to establish a specific design for each concept related to sustainability. No framework has been defined to design graphic information related to sustainability.

In line with other studies (Ahmadi et al., 2021b; Gatsou et al., 2012; Silvennoinen et al., 2017), our study analysed the semantic distance, this being the closeness of the relationship between the objects depicted in the icon and the function being represented. In them, the semantic distance varies depending on the indicator to be represented and thus, for example, the minimum is for the indicator related to water consumption while it is much greater for indicators such as job satisfaction, for example. As for formal aspects, the composition of lines on colour planes predominates, they are not

generally framed on the edges and circles predominate in those that are. The most characteristic colours are blue and its different shades. In most cases, the icons in the same report belong to the same family and in more than half of the cases the colours used in the icons are the corporate colours of the organisation. Having a family of icons that are directly and unequivocally associated with each of the indicators analysed, can be an effective and efficient communication tool for promoting transparency in organisations. This could ensure that icons are correctly understood by all users equally.

In accordance with the first option detailed in Tables 3-6 for each indicator, Table 8 reports an example of potential concepts that could be used to design a family of icons for representing the environmental, social and economic performance and stakeholders related to any organisation, taking into account the current use of icons in corporate reports.

**Table 8.** Example of concepts for designing icons for each indicator

Environmental									
	Raw material	Water	Energy	Renewable energy	Natural gas	Other fuels	Emissions	Waste	
Social									
	Gender diversity	Generational diversity	Functional diversity	Cultural diversity	Equality policies	Contract period	Type of contract	Safety & health	Health programmes
	Work absenteeism	Parental leave	Work satisfaction	Training	Internal promotion	Conciliation	Fight against corrup./bribery	Social action	Local communities
Economic & Stakeholders									
	Economic	Employee	Customer	Supplier	Society				

## 6. Conclusions

This analysis allows us to conclude that there is no standardisation when communicating the social, environmental and economic performance of organisations, or in the case of the stakeholders. This can be misleading for readers when interpreting the content of non-financial information disclosure reports. In addition, it is observed that the same icon is used for several indicators, thereby creating confusion as regards their meanings. For example, the icon showing “shaking hands” is used by several indicators, such as Functional diversity, Equality policies, Safety and health, Work satisfaction, Fight against corruption and bribery, Local communities and Providers. Its use in several indicators makes it difficult for readers to automatically identify and understand its meaning, as they find no direct relationship with the indicator it represents.

To achieve effective communication and a better understanding of the content of non-financial information disclosure reports, there should be unanimity in the way the different indicators are communicated. Considering that the incorporation of icons and graphic elements in this type of reports is increasing, it is necessary to establish a specific and unanimous design that could be used by organisations to communicate their environmental, social and economic performance as well as their relationship with their stakeholders.

## Supplementary material

- Non-exhaustive list of icon databases (Table S1).

- Icons for each indicator for environmental, social and economic performance, and stakeholders (Table S2-S5).

## Acknowledgement

The authors are grateful to the Spanish Ministerio de Ciencia, Innovación y Universidades (Project DPI2017-89451-R) for funding this study.

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