

# Global Sustainability Reporting in the Automotive Industry via the eXtensible Business Reporting Language

Árpád Tóth\*, Alex Suta

Szechenyi Istvan University, Vehicle Industry Research Center, H-9026 Győr, Egyetem Sq. 1, IS-201  
 totha@ga.sze.hu

Sustainability measurement has become one of the most important topics for automotive manufacturers. The financial reporting practice has been faced with an increased digitization and standardization process, which was enabled by the either voluntary or required implementation of the eXtensible Business Reporting Language (XBRL) platform. The obligatory adaption appeared in European legislation, which covers both financial, and non-financial information. In the current study, we have made a comparison of the most significant European and American automakers' sustainability reports data content to utilize the sustainability XBRL taxonomy adaptation. Using literature, the development of disclosure requirements was reviewed, following which the adaptation to global sustainability standards (GRI, SASB) in reporting was examined from a qualitative point of view, using a text mining methodology. It has been concluded that by the biggest automotive manufacturers the conditions are currently met to a limited extent, but the most significant obstacle is the lack of linking sustainability information to financial impacts. If the financial regulations require OEMs to adapt, and potentially disclose negative information (such as pollution data, penalties) may negatively affect investor perception. Based on the review XBRL is capable to become a global standard, however, reported contents should be carefully audited and linked to objectively verifiable financial data to provide relevant information to investors, decision-makers.

## 1. Introduction

Environmental, Social, and Governance (ESG) information are facing increasing use by the capital markets and other stakeholder groups. Today it means a great effort for organizations to ensure that ESG disclosures are meeting quality standards (AICPA and CIMA, 2021a).

To fulfill disclosure requirements, organizations' need arises of establishing effective governance and internal control of sustainability-related operations. Companies need to conduct internal assessments (on financial materiality or risks) to determine the topics in sustainability that are important to the organization and other stakeholders, such as its customers or investors. In the past years companies, especially automotive Original Equipment Manufacturers (OEMs) became more alert based on environmental concerns. To fulfill requirements raised by different stakeholders they started to comply with some of the proposed standards that offered a systematic approach to presenting sustainability information. Despite the wider appearance of sustainability standards in 2010-2015, Szennay et al. (2019) addressed the intentional misuse due to gaining stakeholder preference based on a non-existent sustainability-related performance. Kravchenko et al. (2019) identified over 270 performance indicators available for the sustainability measurement of manufacturing companies, where several gaps occur in standardization. While the main purpose of such standards is providing a higher standard in information quality (reducing the possibility of abusing minimum requirements), at the same time enhancing comparability, these criteria are often violated. While the issues of sustainability information quality are widely addressed in the literature, studies mainly focus on business models and internal processes of sustainability measurement. The perceived importance of sustainability disclosures from the corporate side was often analyzed in the form of questionnaires and interviews; but less reliant on corporate reports and research aiming to standardize and automate evaluation processes. This study addresses the evaluation of the environmentally sustainable performance of the biggest automotive OEMs, being a practical issue of stakeholders such as shareholders or analysts. As confirmed by Ordóñez-Ponce and Khare (2021), GRI standards offer a capable

solution to the global comparability of sustainability information in the automotive sector. In the study sustainability standard systems used from 2015 through 2020 additionally were reviewed by a text mining methodology. In that time interval, the use of GRI and SASB standards in disclosures was measured automatically, which serves as the novelty of the research to enable an objective comparison between years and companies. The validity of the research topic is supported by ongoing standard-setting discussions and regulatory activity aiming to solve the current issue with the use of the eXtensible Business Reporting Language (XBRL).

## **2. Development of regulatory sustainability disclosure requirements: the EU and the US**

In the US sustainability reporting has historically taken place outside of the obligatory submissions to the Securities and Exchange Commission (SEC). However, there is an increasing interest by investors in the disclosure of ESG information in SEC submissions, including proxy statements, annual reports, and quarterly reports (AICPA and CIMA, 2021b). Companies have more possibilities of disclosing this kind of non-financial information. Aligned with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), the types of reports include financial filings, annual-, integrated-, and sustainability reports. Despite possibilities, on average, information aligned with the recommended disclosures was over four times more likely to be disclosed in sustainability reports than in financial filings or annual reports (AICPA and CIMA, 2021b). The TCFD recommended over 60 ESG disclosures in the main areas of Governance, Strategy (with a focus on environmental resiliency), Risk management, and Metrics and targets (TCFD, 2020). According to the regulation issued by the US Securities and Exchange Commission (SEC), all listed companies should disclose certain environmental information in their annual filings, as well as plants that emit carbon above a threshold amount to report GHG emission facts to the Environmental Protection Agency (EPA) annually (Cong et al., 2020).

In the European Union, the responsible organization for the development of the draft standards is the European Financial Reporting Advisory Group (EFRAG), which has started preparatory work for a revision of the Non-Financial Reporting Directive (NFRD) active since 2018 (Lai and Stacchezzini, 2021). At the request of the European Commission, EFRAG published technical recommendations as of April 2021 (EFRAG, 2021) and a roadmap for the development of EU sustainability reporting standards. Before adopting any, the Commission will consult the Member States Expert Group on Sustainable Finance and seek the opinion of the European Securities and Markets Authority and other regulatory bodies (European Commission, 2021). The proposals of the International Financial Reporting Standards (IFRS) Foundation to create a new Sustainability Standards Board are relevant in this context, as is the work already carried out by initiatives including the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB). Standards use different reporting processes, as well as different approaches to materiality. While the guidance is available individually, there is no single recommended way to use the two sets of standards together (GRI and SASB, 2020).

The content of sustainability information published in companies' annual reports is currently subject to minimum regulations, but various standards and guidelines (e.g. GRI, SASB) are available to help businesses achieve quality information. This information is playing an increasingly important role for regulators, owners/investors, and other stakeholders, due to climate change and other environmental factors. In the future, various emission restrictions may also pose a financial risk to businesses. With the increase and standardization of reporting obligations, the ability of companies to mask negative information decreases. In addition to improving the quality of sustainability information, the current transformation also supports digitization. Electronic financial reporting has undergone significant development, with XBRL becoming the leading platform today. XBRL is a freely accessible, international framework designed to increase the comparability of business information. Using it, difficulties arising from custom and fragmented reporting can be overcome. In the EU, the European Single Electronic Format (ESEF) reports, building on the technology of XBRL have become mandatory for listed companies for reporting their financial information, starting from 1 January 2020. Many ESEF financial reports have been yet published, and the used XBRL format is on the roadmap for the development of sustainability reporting of the Corporate Sustainability Reporting Directive (CSRD). This way sustainability reports will be published in a uniform, online, and machine-readable XBRL format as planned from the 2023 business year. This is a significant step forward in the development of the XBRL reporting language, with the framework being used by the U.S. Securities and Exchange Commission (SEC) since 2005 gaining robustness on a global scale. While technological requirements of implementation are already met, there is a missing link in wide-range regulatory issues considering reporting disclosures.

## **3. Methodology**

In the current study, an automated content analysis was carried out based on the most recent five years (2016-2020) of sustainability reports in unstructured pdf formats. Data were collected from official websites of the six

most significant automotive OEMs in Europe and the US (3-3) by 2021 net sales revenues (Statista, 2018). During data gathering, some characteristics in reporting practices, and changes between reporting years were seen. In 2020 Volkswagen (VW) started to use a separate document with references to GRI standards. In 2020 Daimler disclosed separate SASB and TCFD reference tables that highlight pages of the sustainability report. On January 19, 2021, the merger between Peugeot S.A. and Fiat Chrysler Automobiles N.V. was complete that led to the creation of Stellantis N.V. (FCA Group, 2021). Ford provided several documents aiming to reference content indices to the main texts of sustainability, and several other corporate reports and statements found online. Only in the most recent reporting period, Ford presented 9 additional reference tables to the main Integrated Report, containing external links. At the same time, General Motors disclosed in-text reference tables for GRI, SASB, and the TCFD standards, referencing the main text. In Table 2, the column indicating the number of disclosures contain sustainability disclosures (such as “GRI 305-1: Direct (Scope 1) GHG emissions”, or “TR-AU-250a.3: Number of vehicles recalled”) served as the basis of frequency analysis. The introduced criterion was a direct matching of the main text with the sustainability disclosure codes (such as “305-1” or “TR-AU-250”).

*Table 1: Used sample of corporate reports*

Region	Referenced document	Years	Compliance with standards (2020)	Source
EU	BMW Sustainable Value Report	2016-2019	GRI, TCFD	BMW (2021)
	BMW Integrated Group Report	2020		
EU	Daimler Sustainability Report	2016-2020	GRI, SASB, TCFD	Daimler (2021)
EU	Volkswagen Group Sustainability Report	2016-2020	GRI	VW (2021)
US/EU	FCA Group Sustainability Report	2016-2020	GRI, SASB, TCFD,	Stellantis (2021)
	Stellantis Sustainability Report	2020	ISO26000	
US	Ford Sustainability Report	2016/17-2019/20	GRI, SASB, TCFD	Ford (2021)
	Ford Integrated Report	2020/21		
US	General Motors Sustainability Report	2016-2020	GRI, SASB, TCFD	GM (2021)

*Table 2: Sustainability standards and disclosure used in Natural Language Processing*

Sustainability standard category	Number of standards	Number of disclosures
GRI 100 Series: Universal	2	59
GRI 200 Series: Economic Topics	6	13
GRI 300 Series: Environmental Topics	8	32
GRI 400 Series: Social Topics	19	40
SASB Automobiles	1	14 + 5 (simplified)

To achieve certain automated tasks in qualitative content analysis, methodological bits of prior literature were used. Fiandrino and Tonelli (2021) carried out a text mining analysis in official NFRD documents that are applied mandatorily by European listed companies, to understand the main topics covered. Ning et al. (2021) identified topics as part of their text mining methodology using GRI standards, as well as the availability of GRI indicators. Prior findings of Tóth et al. (2021) were used regarding the handling and directed topic retrieval in unstructured file formats. For the Natural Language Processing (NLP) tasks, the Provalis WordStat software was used (Provalis, 2021). The content analysis steps included (1) textual data retrieval from sustainability reports, (2) processing and tokenization of data, (3) quantitative content analysis (word and phrase frequencies, topic generation using factor analysis) based on the defined categorization of standard categories as in Table 1, (4) observation of sustainability disclosure occurrence in main report body text, (5) additional content analysis of GRI reference tables; (6) comparison between years and companies.

#### 4. Results

Although there are no standardized reporting requirements of reports, and there is no obligation to prepare these reports in a machine-readable format, NLP has reached a technological level where keyword frequencies in unstructured datasets are measurable and suitable for analysis. Based on the automated content analysis of the six automotive sustainability reports, it can be concluded that the observed companies have different reporting practices. To evaluate results in the compliance of disclosures to standards, following Provalis (2010) we found that indicators of keyword frequencies and the TF\*IDF (term frequency weighted by inverse document frequency) weighing indicators were used. TF\*IDF indicates, that the higher occurrence of a word in documents will give a higher term frequency (TF), but the less occurrence of a word in documents will result in higher

importance (IDF) for that keyword search in a particular document (Qaiser and Ali, 2018). Outlier values of TF\*IDF might indicate the observation to be unique, and not typical for all reporters.

Table 3 presents the annual changes in the reported disclosure compliance, in an aggregated format by standard categories. For each company group between the years 2016-2020, the keyword frequencies (columns 3-7) and TF\*IDF indicators (columns 8-12) were presented. Sustainability disclosures were categorized according to the GRI standard sets as in Table 2. Colors green and red were used by column to highlight the highest absolute values. When observing a sustainability standard sets' keyword frequency, the included disclosure identifiers were retrieved from the corporate reports' main texts (as in Notes to Table 2). For instance, in its year 2018 sustainability report, Volkswagen group mentioned disclosures of the GRI 100 category on 176 occasions, while tackled environmental disclosures (GRI 300) only 41 times. According to the table, there is no clear trend in reporting practices, however, some drastic changes (sudden change from 0 to n, or n to 0) can be observed. At the same time, the TF\*IDF values indicate how well certain disclosures were reported by all companies in the single year observed. Where the indicator takes a high value, the term frequency for the certain company is relatively uncommon, compared to others in the year observed. In the Year column, asterisks indicate a change in methodology, e.g. the start of using indicator/reference tables separated from or integrated into the observed sustainability report.

Table 3: Disclosure frequency in observed report main texts by standards, companies, and years (2016-20)

Company group	Year	Keyword frequency					TF*IDF				
		GRI 100	GRI 200	GRI 300	GRI 400	SASB TR-AU	GRI 100	GRI 200	GRI 300	GRI 400	SASB TR-AU
VW (2021)	2016*	0	0	0	0	0	0	0	0	0	0
	2017	184	13	32	34	0	36.5	3.2	4.3	6.7	0
	2018	176	20	41	53	0	34.9	4.9	5.5	10.5	0
	2019*	0	0	1	0	0	0	0	0.1	0	0
	2020	2	0	6	1	0	0.4	0	0.8	0.2	0
BMW (2021)	2016*	0	1	2	0	1	0	0.2	0.3	0	0.4
	2017	187	43	63	78	1	37.1	10.6	8.5	15.5	0.4
	2018	47	6	36	47	0	9.3	1.5	4.8	9.3	0
	2019	47	5	33	66	0	9.3	1.2	4.4	13.1	0
	2020	29	9	50	58	1	5.8	2.2	6.7	11.5	0.4
Daimler (2021)	2016	0	0	0	0	0	0	0	0	0	0
	2017	0	0	0	0	0	0	0	0	0	0
	2018*	0	0	0	0	0	0	0	0	0	0
	2019	107	11	25	43	0	21.2	2.7	3.4	8.5	0
	2020	89	12	28	44	8	17.7	3	3.8	8.7	3.2
Stellantis (2021)	2016	1	0	4	5	0	0.2	0	0.5	1	0
	2017*	1	1	2	1	0	0.2	0.2	0.3	0.2	0
	2018	143	11	48	64	0	28.4	2.7	6.5	12.7	0
	2019	56	12	35	56	0	11.1	3	4.7	11.1	0
	2020	62	9	27	27	23	12.3	2.2	3.6	5.4	9.2
Ford (2021)	2016	0	0	1	0	0	0	0	0.1	0	0
	2017	0	0	1	0	0	0	0	0.1	0	0
	2018	0	0	0	0	2	0	0	0	0	0.8
	2019	0	0	0	0	1	0	0	0	0	0.4
	2020	0	0	0	0	2	0	0	0	0	0.8
GM (2021)	2016*	4	0	0	2	0	0.8	0	0	0.4	0
	2017	118	11	27	36	9	23.4	2.7	3.6	7.1	3.6
	2018	119	11	33	42	18	23.6	2.7	4.4	8.3	7.2
	2019	138	13	44	50	20	27.4	3.2	5.9	9.9	8
	2020	138	13	42	50	16	27.4	3.2	5.7	9.9	6.4

It can be observed that in more cases methodological changes were implemented, such as the integration or separation of the fact sheets, serving as the proof of compliance, from main texts of sustainability reports. To filter the distortion effect of such changes the same NLP methodology was implemented on the latest 2020 GRI reference tables. This information serves as an addition to the reported sustainability information's GRI compliance evaluation. Although companies did not provide a systematic approach to reporting compliance to

certain standards in an integrated format to sustainability reports, the openly accessible GRI reference tables were analyzed as the next step.

Table 4: Disclosure frequency in additional documentation

Company group	Year	Keyword frequency			
		GRI 100	GRI 200	GRI 300	GRI 400
VW (2021)	2020	139	9	13	23
BMW (2021)	2020	20	3	8	11
Daimler (2021)	2020	151	26	41	53
Stellantis (2021)	2020	59	6	25	21
Ford (2021)	2020/21	142	19	40	49
GM (2021)	2020	138	13	35	48

In Table 4, the TF\*IDF columns were not presented as it took 0 values in all rows, therefore all standard categories were addressed by all six companies, but with a varying disclosure frequency of GRI categories. Disclosures associated with GRI 100 standards represented the most entries, which can be partly explained by the highest number of disclosures contained by the standards. Despite the total number of GRI 300: Environmental disclosures (n=32) and GRI 400 Series: Social disclosures (n=40), these categories were greatly underrepresented. In Table 5 the most frequent word pairs of the 2020 GRI reference tables of all companies were extracted, based on factor analysis by paragraphs. In the process, phrases exceeding the TF\*IDF average score (12.2) were marked as outliers and removed. It can be seen that the most frequent phrases were closely connected to management concerns and compliance with legal obligations (GRI 100). Therefore, topics like Climate change, GHG emissions, or Energy consumption were less discussed from a frequency aspect.

Table 5: Most frequent phrases (2-5 word combinations) based on automatic text processing

Phrase	Frequency	% of companies	TF*IDF
Management approach	338	100	0
Human rights	217	100	0
Evaluation of the management approach	150	100	0
Explanation of the material topic	148	100	0
Corporate governance	101	83.33	8
Supply chain	97	100	0
Health and safety	82	100	0
Occupational health and safety	51	100	0
Climate change	43	83.33	3.4
GHG emissions	38	100	0
Highest governance body	37	100	0
Energy consumption	34	100	0
GRI standards	31	100	0



## 5. Conclusions

Although the biggest automotive OEMs put an increasing effort into the integration of several sustainability reports (in some cases up to 9), the overview and inclusion in automated analysis require manual intervention and evaluation of compliance. Precise determination of compliance can only be achieved with the apprehension of cross-referenced standard tables and indices following an unstructured format. With the approaching emergence of XBRL-based reporting, it is the basis of comparability that such references of different standard systems will be either linked to each data series as “facts” or a similar technical solution. Another possibility is the centralized creation of a new standard set inspired from such predecessors as GRI or SASB, which are, considering the decades-long operation of their institutions, rather unlikely. The research contributes to the literature of novel text mining applications in industry-specific sustainability reporting practices. The study advocates the use of TF\*IDF keyword frequency indicator that bears further possibilities of integration into existing text mining models. Based on the findings of the study it is proposed that companies should apply XBRL as a sustainability reporting platform and focus on relevant and fact-based content reporting.

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