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In Pursuit of Legitimacy: A Decade of Non-Financial Reporting in the European Automotive Industry

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Abstract

Non-Financial Reporting (NFR) has grown significantly in importance within corporate reporting, particularly in the automotive industry, which is struggling with substantial inherent environmental challenges. However, at the same time, many argue that the NFR in the automotive industry is lackluster and riddled with inconsistencies and information overload. Hence, this study delves into the evolution of NFR in the automotive industry over the past decade, pinpointing key catalysts of change in sustainability reporting. Employing a mixed methods approach, the data analysis of a sample of 27 non-financial reports from three firms is conducted in two stages: initially, a computer-aided frequency analysis to discern hot-spots, followed by a qualitative content analysis using the CONI method on the chosen reports.

Our findings demonstrate a rise in disclosure frequency and a subtle shift towards more quantitative data and specific targets. However, the firms studied displayed significant discrepancies in what their reports highlighted, indicating a lack of standardization in this field. Furthermore, regulations appear to have minimal influence on the firms' NFR development. Instead, legitimacy concerns seem to be the main driving force, further explaining the disparities between reports as different firms have varying primary legitimacy concerns.

In conclusion, the results of this study suggest that the current regulatory landscape is insufficient, placing legitimacy at in the drivers seat. Therefore, regulations need to be restructured to align with the requirements of regulators, the desires of stakeholders, and the objectives that firms aim to achieve, ultimately forging a landscape where NFRs include relevant information that can be effortlessly compared between firms.

Acknowledgements

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Contents

List of Abbreviations

- CA: Content Analysis
- CONI: Consolidated Narrative Interrogation
- CSRD: Corporate Sustainability Reporting Directive
- ESG: Environmental Social Governance
- EU: European Union
- EV: Electric Vehicle
- ETS: Emissions Trading System
- GRI: Global Reporting Initiative
- NFR: Non-financial reporting
- NFRD: Non-financial reporting directive
- NLP: Natural Language Processing
- SDG: Sustainable Development Goals
- UN: United Nations
- ZEV: Zero Emissions Vehicle

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Introduction

1.1 Background

Non-financial reporting (NFR) has become an increasingly important aspect of corporate reporting in recent years. The purpose of NFR is to disclose information that goes beyond traditional financial reporting, such as environmental, social, and governance (ESG) data, in order to provide stakeholders with a more comprehensive view of a company's performance and impact on society (Erkens et al., 2015). This practice originated from the notion that corporations should take a proactive stance on societal issues and engage in sustainability efforts, which was then translated into a broader form of reporting beyond mere financial metrics. Where companies engage in NFR for various reasons, including to legitimize their operations and demonstrate their social and environmental responsibility, to support their marketing efforts, and to comply with regulatory requirements (R. Gray et al., 1995).

The automotive industry presents an interesting case for studying NFR, as it is a highly regulated industry that faces significant environmental and social challenges. It's an industry going through a disruptive phase with the emergence of electric vehicles (EVs) and growing societal concerns about carbon emissions and climate change (McKinsey, 2021). Only two decades ago, electric vehicles (EV) were barely a topic within the industry. Fast forward to today, McKinsey (2021) predicts that EVs will have a 75% market share in the EU market as early as 2030, and VolvoCars (2023), which presented its first electric vehicle in 2019, aims to have 50% of their total sales being EV's as early as 2025.

Notably, the rise of EVs reflects the larger trend towards sustainability in the automotive industry, driven by both consumer demands and government regulations. Moreover, the adoption and application of technology and innovation play a significant role in how the industry responds to these challenges, making the industry's NFR even more crucial for stakeholders to understand the company's strategic direction and performance.

1.2 Problem Discussion

A consistent issue in the context of NFR is that the term NFR lacks a formal definition as opinions on what it means and entails in academia varies (Haller et al., 2017). This situation creates a potential inconsistency in the NFRs across industries and regions, as different firms might interpret and apply the concept based on their own interpretations or strategies (Deegan, 2002). In contrast to regional inconsistency, the European Union with the combination of having the NFRD implemented (EuropeanComission, 2023) and also being home to some of the largest automakers in world, makes it an interesting and solid base for further examination.

Moreover, the role of NFR has evolved over time, with companies increasingly using it as a tool to respond to specific events or scandals that affect their reputation and credibility (Corazza et al., 2020; Bellucci et al., 2021). The effective use of NFR in these situations is further complicated by the often diverse and sometimes conflicting interests of various stakeholders, making it challenging to determine which aspects should be included in the reports and how

they should be presented (Stolowy and Paugam, 2018).

Despite the growing importance of NFR and the unique context of the automotive industry, there are concerns about the quality and relevance of NFR disclosures (Stolowy and Paugam, 2018; Deegan, 2002). One key issue is the lack of a well-regulated environment that ensures that companies report relevant and reliable information (Singleton-Green and Hodgkinson, 2013). There is also a lack of consensus on what constitutes "good" NFR, and how it can be effectively regulated and standardized (Haller et al., 2017).

This lack of understanding and regulation is a problem for regulators and other stakeholders who need to be able to construct effective regulations that address the challenges of NFR in the automotive industry. For example, there is no clear consensus on what types of information should be disclosed in NFR, and how this information should be presented to stakeholders (Stolowy and Paugam, 2018; Haller et al., 2017).

In addition, it is not clear how various trends and events such as electrification, regulatory changes or scandals effect the long-term development of firms NFR since most available research has focused on immediate event responses, actual change to sustainability performance, or change in the usage of various frameworks such as the GRI (Boiral et al., 2022; Aluchna et al., 2022; Caputo et al., 2020; Breijer and Orij, 2022). As previously discussed, understanding how and why NFR develops, and especially how regulations effect the development, is vital for increasing the quality of NFR through future regulations. Hence, research into the topic is required to gain an understanding into whether the current state of NFR, which as per our previous discussions is bad, is due to regulations not having the intended effects or some other driving force which pushes the field into the wrong direction. Further, research of a historical overview nature has been called for by several scholars (Villiers et al., 2017; Parker, 2015)

1.3 Purpose

This thesis purpose is to provide insights into the development of NFR in the automotive industry over a ten-year period, from 2011 to 2021. Specifically, we aim to identify the specific purposes as to why NFR has developed over time and in extent how much of a effect the current regulations have had in the shaping of the current landscape of NFR within the European automotive industry. By exploring this question, we aim to contribute to a better understanding of NFR and its regulatory challenges, as well as provide insights for policymakers, regulators, and other stakeholders.

1.4 Research Questions

1. *How has sustainability reporting developed in the European automotive industry over the last decade?*
2. *What has been the main drivers for change regarding sustainability reporting?*

Literature Review

This chapter provides the literature review for this study. Firstly, we clarify our use of the term "NFR". Secondly, we discuss the three main areas of domain studies, which include "The Current State of NFR in the EU", "Reasons for engaging in NFR", and "NFR in the automotive industry". Lastly, we offer a brief discussion of the connections between the different areas.

2.1 The Current State of NFR in the EU

The term "Non-Financial Reporting (NFR)" is commonly used in various contexts and does not always refer to the same thing. Hence, in this thesis, NFR refers to the disclosure of information that is not directly related to a company's financial performance, but instead relates to its social, environmental, and governance (ESG) impacts and practices. This information can include a wide range of topics, such as a company's carbon emissions, labor practices, human rights policies, or community engagement initiatives. The purpose of NFR is to provide stakeholders with a more comprehensive and holistic understanding of a company's impact and value beyond its financial metrics and can be both included in the actual annual report of a firm or as a standalone document. (GlobalNAPS, 2017)

These practices are regulated by the European Union, specifically through the Non-Financial Reporting Directive (NFRD) – 2014/95/EU (EuropeanComission, 2023) which is the current legislation that firms within the EU must comply within the realm of NFR. This law applies to all large firms with over 500 employees and all publicly listed firms. In essence, the law requires public firms to disclose relevant information on environmental, social, human rights, anti-corruption and bribery, and board diversity matters. However, the law's lack of precision on what to report and the absence of standardization means that many firms choose to follow more structured reporting frameworks such as the Global Reporting Initiative standards (GRI, 2023). However, the NFRD is since January 5, 2023 replaced by the Corporate Sustainability Reporting Directive (CSRD) which applies to more firms. The first reports which will be directly effected by the CSRD will be the reports released in 2024. However, being aware of the CSRD in the context of this study is relevant since the CSRD could have a potential effect on the analysis in this thesis since firms will likely try to adapt to the new regulations before they are mandated to.

Despite the regulations, many scholars argue that the current requirements are insufficient and have had little effect on the quality and relevance of NFR disclosures (Stolowy and Paugam, 2018). Stolowy and Pangam argue that the increased demand for NFR has resulted in information overload, a sentiment echoed by Singleton-Green and Hodkinson (Singleton-Green and Hodgkinson, 2013). However, Singleton-Green and Hodkinson suggest that the criticism of information overload, whilst true, also is somewhat contradictory since most agree that there also is a lack of actual relevant information in NFRs. They point out that market and regulatory failures have led to this situation, highlighting the need for improved regulations.

Stolowy and Paugam (2018) also argue that the lack of convergence between regulators such as the European Commission, standard setters such as the GRI, and leading sustainable firms is a significant issue with the current regulations. This lack of convergence contributes to the information overload present in modern-day NFR and reduces its relevance for stakeholders. Understanding why this convergence is absent is crucial, and this thesis aims to address this issue.

Furthermore, Haller highlights the issue of quality in NFR, specifically the lack of consensus on what constitutes "quality" (Haller et al., 2017). Stolowy and Paugam (2018) also share this sentiment, stating that there is no agreement on what "quality" means in the context of NFR. Despite the lack of consensus, the demand for "higher quality" NFR disclosures is frequently voiced. Therefore, it is necessary to establish a clear understanding of "quality" in NFR. While this thesis will not provide a definitive answer to this question, it aims to contribute to the improvement of convergence in NFR, which is a good first step toward agreeing on what constitutes high-quality NFR disclosures.

The lack of the discussed convergence between regulators, standard setters, and leading sustainable firms in the current regulations, as argued by Stolowy and Paugam (2018), can lead to a confusing and overwhelming NFR landscape. This is particularly relevant for stakeholders who rely on NFR to make informed decisions about a firm's sustainability performance. Additionally, the lack of agreement on what "quality" means in the context of NFR, as pointed out by Haller and Stolowy and Paugam (2018), further complicates the situation. This lack of clarity on what information should be included and how it should be presented can result in firms disclosing only what is required by law or omitting relevant information altogether. Hence, it is imperative to investigate how convergence can be improved in the NFR landscape, as this will contribute to the establishment of a standard for "quality" in NFR, which in turn will increase its relevance and usefulness for stakeholders. Hence, this study will contribute to this purpose through extending the current understanding regarding why firms engage in NFR which will be further discussed in the next section.

2.2 Reasons for Engaging in NFR

2.2.1 Legitimacy

According to Deegan (2002), legitimacy theory is a sociological theory that explains how organizations seek to maintain or gain legitimacy in the eyes of various stakeholder groups. In the context of accounting, legitimacy theory suggests that organizations must present their financial information in a way that is perceived as legitimate by external stakeholders to maintain or regain their trust and support from society and stakeholders. Deegan (2002) argues that one way organizations can seek to gain or maintain legitimacy is by providing comprehensive NFRs. These disclosures provide information about an organization's social and environmental impacts and can help to demonstrate the organization's commitment to meeting the expectations and values of its stakeholders. The use of social and environmental disclosures can have a legitimizing effect on an organization, as they may be perceived as evidence of the organization's responsibility and concern for the well-being of society and the environment. This, in turn, may lead to increased trust and support from external stakeholders.

However, the use of sustainability disclosures can be complex, as there may be conflicting expectations and values among stakeholders, and organizations may face challenges in determining the appropriate level of disclosure. Additionally, the perceived credibility and reliability of social and environmental disclosures may vary among stakeholders, potentially affecting their effectiveness as a legitimization strategy. Therefore, although it is widely accepted that firms use NFR for legitimacy, it is not entirely clear in which contexts it is used, as well as how, but there are certain situations in which more concrete example can be found, such as in the case of scandals and the proceeding scandal management.

A specific case in which NFR was used to counter a scandal was the Costa Concordia disaster, which was studied by Corazza et al. (2020). Corazza found that Costa Cruises (the firm which owned Costa Concordia) made substantial changes to their NFR in the year following the disaster. However, according to Corazza et al. (2020), the strategy employed by Costa Cruises was to distract the reader away from the disaster and instead put focus on corporate information using images and textual tools. One might argue that it is strange for a firm not to focus NFR disclosures on a disaster of the scale of Costa Concordia. However, Corazza et al. (2020) argued that this strategy likely maximized the legitimizing effect of the NFR disclosures, as the accident was in hindsight avoidable, and "hiding" the disaster was basically Costa Cruises' only viable option. Nonetheless, there are instances related to scandals/crises where this has not been the imposed strategy. Bellucci et al. (2021) showed in their paper that when firms engage in NFR after a scandal, the strategy that has the most benefit to the firm is to be transparent and take full responsibility, as this makes the firm be perceived as less hypocritical. Therefore, these two studies show that there is no one-size-fits-all approach to NFR disclosures after a scandal or crisis. It is relevant to further explore when firms use NFR in relation to scandals so that regulators can develop regulations that make NFR yield the information that is actually relevant to stakeholders.

Beyond reactionary changes to NFR such as scandal management, there are also more subtle changes which in accordance with Stolowy and Paugam (2018) leads to information overflow. One possible source of the additional information could be marketing-related content, which could also be called firms legitimizing themselves towards customers. While NFR's are intended to serve both shareholders and stakeholders, Lindgren et al. (2021) found that NFR's are more geared towards satisfying the needs of shareholders than stakeholders. Shareholders, as representatives of investors and public opinion of the firm and its products, can be a suitable audience for marketing efforts, making NFR's a potentially valuable forum for conducting such efforts. Although few studies have been conducted specifically on how firms approach marketing in their sustainability reports, annual reports in general have been found to be commonly used for marketing purposes (Stanton and Stanton, 2002). Furthermore, as Gallego-Álvarez et al. (2010) and other scholars suggest, non-financial information such as sustainability information is an efficient area for firms to market their products or services. Thus, it is reasonable to assume that marketing strategies and techniques commonly used in annual reports could be applied to NFRs, given the flexibility of the information contained therein, the efficiency of marketing non-financial information, and the suitability of NFR readers as marketing targets.

Beyond marketing towards customers, in line with S. Gray (1988), NFR can also serve as a means for firms to manage their social and environmental impacts and improve their image with stakeholders. Gray argues that firms engage in social and environmental reporting not only to provide information to external stakeholders but also to "rationalize and justify their social and environmental behavior" internally. Through the process of compiling NFR, firms may gain a better understanding of their own social and environmental impacts and identify areas where they can improve. Additionally, NFR may help firms to better communicate their sustainability goals and initiatives to employees and other internal stakeholders, which can foster a culture of sustainability within the organization.

2.2.2 Regulations

Another reason for firms to engage in NFR is that they are legally obliged to do so. This applies to all firms within the scope of the studies, as well as to all EU firms that meet two of the three following criteria: (1) More than 250 employees, (2) More than €40 million net turnover, (3) More than €20 million on the statement of financial position (GrantThornton, 2022). While firms are required to file NFRs, the contents of those reports are less detailed and mostly up to the firm. Thereto, one can also make the argument that firms might be prone to be more "responsible" in their NFR efforts to avoid being more heavily regulated in the future. Hence, it is possible that some firms engage in NFR as an effort of regulatory capture (Bó, 2006). However, whilst this might be the case, it will be exceedingly hard to detect in the scope of this study, but it is a potential area for future research.

Furthermore, it is also relevant to note that the latest round of legislation introduced by the EuropeanComission (2023) requires all NFR to be audited, which was not mandatory before. Hence, all the reports analyzed in this thesis will not be non-voluntary audited by a third party. Also, it should be noted that several studies referenced in this thesis have been conducted on firms outside the EU, which are not subject to the same regulations regarding NFR. While selecting studies to include in the thesis, the authors have considered this aspect.

All in all, regulations will play a role in what firms report. However, it is not shown in previous research how vital of a role regulations play in the shaping of sustainability reports over-time since it is not impossible that legitimacy concern trump the current regulations which would lead to regulations having little to no effect. Hence, this study will set out to identify if regulations and changes in regulations have played a part in development of the sustainability reports of today or if the concern for legitimacy already covers what is mandated by regulations and beyond. Further, the automotive industries changing nature which will be discussed in the forthcoming section which will provide extra nuance to this issue.

2.3 NFR in the Automotive Industry

The automotive industry is a sector that has come under scrutiny for its environmental impact, with concerns over emissions and sustainability driving the industry to shift its focus towards cleaner and more sustainable practices (McKinsey, 2021). As a result, non-financial reporting (NFR) has become increasingly important for automotive firms, as they seek to demonstrate their commitment to sustainability and responsible business practices to stakeholders. One reason why the automotive industry is a significant driver of NFR is due to its size and

importance in the global economy (Beretta et al., 2021). Automotive firms are among the largest and most influential companies in the world, and their operations have a significant impact on the environment and society (Pohl, 2021). As a result, automotive firms are under increasing pressure from stakeholders, including investors, consumers, and regulators, to improve their sustainability practices and disclose relevant information through NFR.

The shift towards sustainability in the automotive industry is expected to lead to a change in the way that firms approach NFR. Studies have shown that there is a positive correlation between environmental performance and the quality of environmental disclosures, suggesting that firms with poor sustainability practices are less likely to have comprehensive and insightful NFR in this area. For instance, a study by Herbohn et al. (2014) found that Australian mining companies with higher environmental performance tended to have higher-quality environmental disclosures. Similarly, Lodhia et al. (2022) found that the top 50 Australian firms tended to focus on positive sustainability impacts in their reporting, rather than negative impacts, suggesting that firms with poor sustainability performance may be less likely to disclose negative impacts. Furthermore, in their analysis of French firms, Bacha and Ajina (2019) found that firms with higher sustainability performance tended to have more readable and comprehensive annual reports, while firms with lower sustainability performance were more ambiguous and less detailed in their reporting. These findings suggest that firms may use NFR as a way to demonstrate their commitment to sustainability and responsible business practices, but may also use it as a marketing tool to promote positive aspects of their business. Additionally studies such as those by S. Gray (1988) and Bellucci et al. (2021) have shed light on some of the more explored motivations for NFR, such as a legitimizing strategy and scandal/crisis management. These insights from other sectors opens up for possibility of observing similar patterns in the automotive industry.

While regulations and legitimacy are well-known reasons for firms to engage in NFR, there may be other reasons as well. For example, some firms may see NFR as a means to differentiate themselves from competitors and gain a competitive advantage (Beretta et al., 2021). By highlighting their sustainability efforts and social responsibility in NFR, these firms may attract customers who prioritize these values in their purchasing decisions. However it shall also be noted that some firms may engage in NFR simply because they believe it is the right thing to do. These firms may see social and environmental responsibility as an inherent part of their corporate identity and view NFR as a way to demonstrate their commitment to these values.

Given the growing importance of sustainability in the automotive industry, it is likely that NFR will continue to be a key tool for firms seeking to demonstrate their commitment to sustainability and responsible business practices. As the industry shifts towards more sustainable practices, we can expect to see changes in the types of disclosures that firms make in their NFR, as well as the level of detail and comprehensiveness of those disclosures. This makes the analysis of NFR in the automotive industry an important area of research, as it can provide insights into how firms are responding to the growing demand for sustainability and responsible business practices, and how they are using NFR to communicate their efforts to stakeholders. This field is something this thesis sets out to extend by analyzing what actually drives the development of NFR.

2.4 Summary

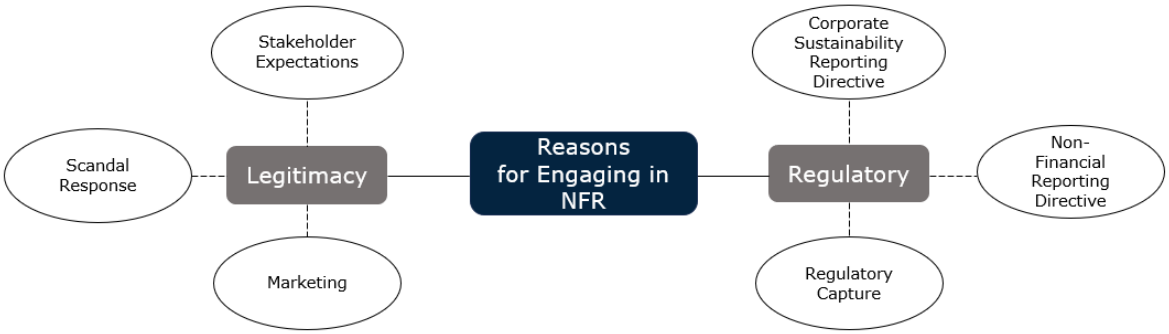

Figure 2.1: Reasons for Engaging in NFR

This literature review highlights the known drivers behind why firms engage in NFR, as shown in 2.1. The realm of Legitimacy entails three main pillars which drive why firms engage in sustainability reporting to strengthen their legitimacy in the form of stakeholder expectations, scandal response and marketing. In regards to regulations, the NFRD and CSRD are the two main legislations which could affect EU automotive firms to make developments to their reporting. However, in regard to regulations firms could also change in order to try to shape future regulations through regulatory capture.

Currently, many scholars such as Stolowy and Paugam (2018) and Singleton-Green and Hodgkinson (2013) argue that the quality of NFR in the EU is lackluster. A common theme behind this opinion is the prevalence of information overload which makes it difficult to both find relevant information in reports as well as comparing reports between firms. Stolowy and Paugam (2018) believes that the main factor behind the observed information overload is a lack of convergence between stakeholders regarding both the intended purpose and readers of NFR. Henceforth, both Stolowy and Paugam, 2018 and Haller et al., 2017 agrees the current state of NFR in the EU even lacks a clear understanding of what "high quality" NFR even is.

Hence, to be able to understand what "high quality reporting" acctually is, it is important to understand why firms even engage in NFR in the first place. Previous studies highlights two main reasons, either to improve the image of the firm (legitimacy), or simply becouse they are mandeted to (regulations). Regarding legitimacy, an area that has been widely covered by previous research is how firms manage their legitimacy after legitimacy-damaging scandals, such as the Costa Concordia disaster. In analyzing the aftermath of the Costa Concordia disaster in regards to Costa Cruises NFR, Corazza et al. (2020) found significant changes in the reportings which tendered towards increasing the legitimacy of Costa Cruises towards its stakeholders.

Further, other forms of legitimacy driven motivations such as publishing NFR's for marketings purposes (Stanton and Stanton (2002); Gallego-Álvarez et al. (2010)) or general stakeholder/investor image improvement (S. Gray, 1988). As argued by Stolowy and Paugam (2018), this is likely the main reasons to why the information overload in NFR is observed.

Regarding NFR in specifically the automotive industry, as argued by Beretta et al. (2021), the industries position as both influential and impactful to both the global economy and the sustainability landscape leads to a higher level of scrutiny of the firms NFR's. Hence, automotive firms can be expected to put above average efforts into how their NFR's are structured and formulated. Furthermore, in line with Herbohn et al. (2014) and Lodhia et al. (2022), as the industry is in a state of change towards being more sustainable (McKinsey, 2021), the NFR which is published is likely to improve in their quality as the firms sustainability performance improves.

Overall, understanding the range of reasons for firms to engage in NFR is important for regulators and stakeholders. By gaining a better understanding of the motivations behind NFR, regulators can develop more targeted and effective regulations that meet the needs of all stakeholders. Additionally, stakeholders can gain a better understanding of the factors that drive firms to engage in NFR, which can help them to interpret and evaluate NFR disclosures more effectively.

Methodology

The following section presents the methodology applied in this study. Firstly, the research approach and design is presented and motivated. Secondly the data collection methods used are described and likewise motivated. Thereafter an outline of the data analysis approach is presented and finally the chapter is concluded with a discussion on research quality and methodological limitations of the study.

3.1 Research Design

This thesis adopts pragmatism as its foundational research philosophy to examine the development of sustainability reporting practices within the European automotive industry. Pragmatism emphasizes the practical and real-world application of knowledge, prioritizing the usefulness and effectiveness of theories in solving real-world problems (Kaushik & Walsh, 2019). That is, we the authors put little emphasis on what paradigm a given method traditionally belongs to, the sole concern is to use the methods that have the highest potential of providing the answers we are after (Feilzer, 2010). Aligning with the reasoning by Modell (2010) the mixed methods approach grants the possibility to combine qualitative and quantitative methods to comprehensively understand our research problem. By utilizing a pragmatic mixed methods approach, this study aims to provide regulators and other stakeholders with insights into the drivers of change in the industry's non-financial reporting practices. Pragmatism posits that reality is ever-changing, and knowledge is created and validated through experience, emphasizing the usefulness of a theory rather than its absolute truth (Kaushik & Walsh, 2019). Through this pragmatic lens, the researchers seek to identify and analyze the factors that influence the development of sustainability reporting practices in the industry, without providing any specific solutions or policy proposals. By doing so, this research aims to contribute to the body of knowledge on non-financial reporting practices in the industry and inform regulatory and stakeholder decision-making.

As noted the study applies a mixed methods content analysis to examine a series of sustainability reports from the three actors within the European automotive industry. The mixed methods approach is well aligned with the pragmatic philosophy, in the strive of practicality and usefulness and the dual characteristics of the data at hand, both qualitative and quantitative a mixed methods approach is warranted (Feilzer, 2010). This is aimed to be conducted through textual analysis based on a combination of computer- aided natural language processing (NLP) and a manual content analysis. The purpose of this methodological approach is to provide qualitative insight in the matter of how the reporting efforts in terms of non-financial reporting have developed over time and what has driven change in this area. The motivation behind leveraging NLP in conjunction with manual coding in the traditional sense is to increase the feasibility of handling a larger sample of annual reports in line with the reasoning of (Abram et al., 2020). In this case that is a timeframe of ten years for these three companies. The decade-long timeframe (2011-2021) is not only feasible due to the mixed methods approach, but relevant. For reasons that it captures the both the introduction of the NFRD (announced in 2014 and implemented in 2018), the ongoing sustainable transformation of the automotive industry as well as both short and long term effects of scandals such as that of Volkswagen AG *Dieselgate* (Aichner et al., 2021).

3.2 Data Collection

The data used in this study is the sustainability reports produced and distributed by the firms themselves as mandated by the NFRD. (EuropeanComission, 2023). The initial sampling choice of only focusing on European firms is motivated by having as high of a geographical and societal homogeneity as possible in the sample. This with the aim to be representative for the underlying population of study as Patton (2002) highlights to be an objective of qualitative sampling. Additionally, the prevalence of NFRD (EuropeanComission, 2023) and its relative standing in terms of global regulatory standards makes the EU-region a solid ground for comparing NFR practices over time and across firms. All of the selected companies have been subject to the requirements presented in the NFRD during its existence, with the three of them being publicly traded and having over 500 employees (ibid).

Thereafter it is determined that the focus is on only the automotive industry with the motivation being the huge environmentally driven transformation the industry has and is going through (Capgemini, 2022). Further, as discussed previously in this thesis, the industry is due to its size and nature of operations a main driver in terms of sustainable impact. When such an industry goes through a transformation, internalizing the regulatory requirements as operational strategies, it is of interest to examine the development and its core aspects over time. That is, adapting their business model to align with the regulatory requirements.

Company	**Origin**	**Seat**	**Market share**	**No. Employees**	**Public listing**
Volkswagen AG	Germany	Wolfsburg, Germany	24,20%	645 868	Frankfurt Stock Exchange
Groupe PSA (Stellantis)	France (Italian-american)	Hoofddorp, the Netherlands (Rueil-Malmaison, France)	18,20%	272 367	Euronext Paris (Borsa Italiana, New York Stock Exchange)
Volvo Cars	Sweden	Gothenburg, Sweden	2,20%	43 200	Nasdaq Stockholm

Table 3.1: Selected companies, key stats (Bekker, 2023; Capital IQa:b:c, n.d.)

The choice of three of the most prominent automotive manufacturers in Europe (Table 3.1) is motivated by the fact that these actors control a large portion of the European market (Bekker, 2023). In order to gain a geographically diverse sample the choice fell on Germany, France (now Italian-American)[1] and Sweden. Additionally the three actors represent a diverse set of the market, from the segment of premium cars to more affordable "peoples cars".

With regards to retrieving the required data (NFRs), the process involves visiting the equivalent of an investor relations section on the respective company website, browse through each year and download the report in PDF format. Of the 30 sought after reports it was possible to publicly retrieve 27 of them, the three missing reports where the 2015 Sustainability report of Volkswagen and the 2013 and 2015 reports respectively of Groupe PSA. Amongst the missing report, Volkswagens 2015 report stands out since it was during 2015 the dieselgate scandal occurred ("Volkswagen emissions scandal", 2023). Hence, the report would have been extra interesting to examine in regard to scandal management. However, after a thorough search,

[1] Groupe PSA merged with Fiat-Chrysler in 2021. (Stellantis, 2021)

the report could not be acquired as it seems to have been removed from the internet, for which purpose this thesis will not speculate. All of the examined reports are listed in Appendix 4, and the corresponding .pdf files are available in this projects repository (Rafstedt & Lidvall, 2023).

3.3 Data Analysis

The main proposed method of analysis is the conventional form of content analysis as defined by Hsieh and Shannon (2005) as the systematic coding and categorization of texts, images and alike with the aim of identifying patterns and themes based on the data itself. This approach of analysis will grant the opportunity to describe in a qualitative sense how the act of non-financial reporting has evolved over time within the automotive industry. Figure 3.1 shows an overview of the analysis process conducted.

Textual analysis in general is commonly used within qualitative research to analyze and interpret written language and depending on approach provide researchers with an indication of the underlying assumptions or values portrayed through text or the insights of the more formal type when leveraging coding and categorization methods (Patton, 2002). As stated at the start of this chapter, this study leverages both aspects through a mixed methods approach. Doing so by letting the more formally leaning NLP approach be the filtering process by which semantic trends and hot-spots that might be of interest can be highlighted and let the more nuanced manual content analysis focus on those areas. The following figure (3.1) gives an overview of the methods used in this study.

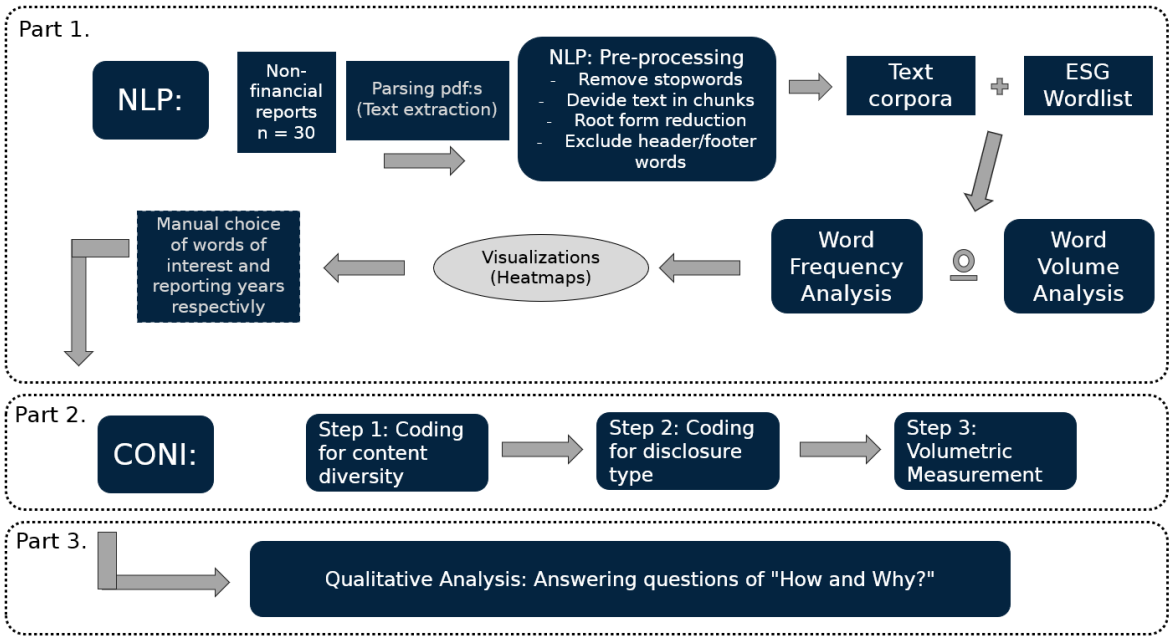

Figure 3.1: Analysis Overview

3.3.1 Natural Language Processing

This section refers to the first part of the analysis conducted through the use of (Figure 3.1) Natural language processing (NLP). Which is a field within computer science often linked to artificial intelligence and has its basis in the interaction between computers and humans through natural language, i.e human language (Fisher et al., 2016). In the context of textual analysis, NLP methods can be used to automate the process of analyzing large bodies of unstructured textual data, and identifying key words and phrases, categorizing text by topic as well as estimating sentiment. The nature of NLP makes it particularly useful for analyzing large bodies of text efficiently and in a faster manner than its manual counterpart, however with these benefits comes the risk of losing subtle details or nuance.

The NLP-process starts with parsing the text. Parsing the sustainability reports and extracting text can be challenging due to the unstructured nature of the data and the prevalence of various images and figures. To address this issue, an author-developed script in the programming language Python (Van Rossum & Drake, 2009) is used to extract the text from the PDF files (Part 1 of Figure 3.1). The code developed in this thesis can be found in the GitHub repository (Rafstedt & Lidvall, 2023). Once the text has been retrieved from the corpus of data, a range of data pre-processing steps are done in order to improve the algorithm (Part 1, Figure 3.1).

Pre-processing steps:

1. Tokenization: breaking down text into smaller chunks, commonly words. (Microsoft, 2023)

2. Lower-casing: the process of making all characters lower-case. (TowardsDataScience, 2022)

3. Stop-word removal: the process of removing common words such as "the," "and," and "or" that do not carry any meaning individually and risk skewing the analysis. (IBM, 2021)

4. Lemmatization: the concept of reducing words to their root form to improve analysis accuracy by treating variations of a word as a single word. For example, for most NLP purposes "running" and "run" have the same meaning, but will however be treated as two different words in their base form. Hence, lemmatization is used to reduce "running" to its root form "run". (McCarthy & Boonthum-Denecke, 2012)

5. Word Selection: This concept is more niche towards the purpose of this thesis. Given the purpose of analyzing sustainability related words, the noice from all non-sustainability related words, which naturally makes up the bulk of the words, needs to be filtered. Hence, a pre-defined list of set sustainability words (which structure will be discussed below) works as a filter so all non-sustainability related words gets removed. However, it should be noted that a non-filtered version also exists which will be utilized later on in the qualitative analysis, were the non-sustainability related words provide the needed context.

6. Header/Footer cleanup: Whilst analyzing the data, it was identified that some phrases that were located in the header/footer of some sustainability reports drastically increased some word counts, however, as the words only appeared in every header they had no meaning. Hence, the phrases "sustainability report" (if mentioned in the text if would be self-referencing to the sustainability report itself which was deemed to be meaningless to the purpose of this thesis), "corporate social responsibility", and "strategic guidelines, commitments and indicators" was removed.

ESG Key Word List

With regards to step 5) of the pre-processing, a potential risk associated with using a pre-defined word list for filtering is the imposition of the authors' biases on the final results by inadvertently excluding relevant words. Nevertheless, filtering is essential for obtaining meaningful results. Consequently, a list of 141 sustainability-related words has been meticulously compiled and is provided in Appendix 1. (This component of the analysis is attributable to Part 1, Figure 3.1).

Given the relative absence of a suitable pre-existing list, the authors of this thesis initiated the process by creating a list of all pertinent sustainability-related words they could conceive. Furthermore, to complement the list, the GRI (n.d.) and the well aligned HSBC (n.d.) glossaries has been advised to fill out any potential gaps. Further to mitigate the risk of biases in the list and to address any potential gaps, the generative AI model ChatGPT, n.d. was employed to expand the word list. The prompt utilized to generate the comprehensive list is available in Appendix 2.

Word-Frequency Analysis

The NLP-method which was deemed to be most suitable to the purpose of this thesis is word-frequency analysis (Figure 3.1). Other methods, mainly topic modeling and sentiment analysis, were considered as well; however, there were several reasons that led to the selection of word-frequency analysis over these alternatives. Word-Frequency analysis is a proven method for analyzing larger sets of data and has been applied in countless previous studies (Rajput et al. (2020); Roberts et al. (2006); Petrova et al. (2012))

First, word-frequency analysis enables a more granular understanding of the language used in sustainability reporting, allowing researchers to identify specific terms and phrases that are important for capturing changes in reporting practices. This level of detail is crucial for understanding how sustainability reporting has evolved over the past decade. Topic modeling, while useful for discovering latent themes in large collections of text, might overlook subtle shifts in the use of particular terms or phrases that are indicative of changing priorities and concerns within the European automotive industry.

Second, word-frequency analysis is more focused on the actual terminology used in sustainability reporting, which is in line with the research objective of analyzing the development of sustainability reporting over the last 10 years. This method allows for the identification of specific words and phrases that have become more or less prevalent in the reports, providing valuable insights into the evolving priorities and concerns of European automotive firms. In contrast, topic modeling groups documents into broader themes, which may not directly capture the specific terminology changes of interest.

Third, sentiment analysis primarily focuses on the polarity of the text, determining whether the content is positive, negative, or neutral. While this can provide useful information, it may not be as relevant for the research question at hand, as it does not directly address the development of sustainability reporting in terms of content and terminology. Moreover, sentiment analysis can be challenging to apply to the complex and specialized language found in sustainability reports, leading to potential inaccuracies and misinterpretations.

In summary, word-frequency analysis was chosen for this thesis because it offers a more granular, focused, and relevant approach for the purpose of this thesis. While topic modeling and sentiment analysis have their merits, they were ultimately deemed less suitable for the specific research objectives of this study.

Word-Volume Analysis

A weakness of word-frequency analysis is that, in this way of implementing it, it does not capture the relationship between a word and the total amount of words in the report, i.e, how focused the word was. Thus, to capture potential differences in the sheer volume of words in the sustainability reports, which can be relevant to the analysis, an analysis of the total word-volume (Figure 3.1) in each report is also performed.

3.3.2 Manual Content Analysis

Human coding of textual data involves the researcher reading and interpreting the text manually, and consequently assigning codes or labels to represent key themes, ideas, or concepts to the data. This process can be done in many ways however for the purpose of this study the aim is to deploy a value-free coding schema based on the themes and patterns that we observe in the data. That is, the conventional form of content analysis as defined by Hsieh and Shannon (2005).

Content analysis (CA) in general as defined by Weber (1990) is a research method that uses a given set of procedures to make inferences of textual data. He also points out in his book on the some of the advantages of content analysis where the following three stand out he most;

- *"Communication is a central aspect of social interaction. Content-analytic procedures operate directly on text or transcripts of human communications.",*
- *"The best content-analytic studies use both qualitative and quantitative operations on texts. Thus content analysis methods combine what are usually thought to be antithetical modes of analysis",*
- *"Compared with techniques such as interviews, content analysis usually yields unobtrusive measures, in which neither the sender nor the receiver of the message is aware that it is being analyzed. . . " (Weber, 1990).*

The three aspects resonate well with this study, firstly the researchers recognize the value and effect of human communication in society and with regards to the textual data at hand, and the multifaceted purpose such information serves. Secondly, inclusion of a NLP approach, partially leaned towards the quantitative side of methods, i.e word frequency's, topic modeling etc. combined with the qualitative content analysis aligns with the notion that a mixed methods approach to a study built on CA is highly beneficial. Thirdly, the benefit of having the creation of the data-set separated from the study serves our purpose of providing research of high validity.

In their 2010 paper Beck et al. (2010) proposes an extension of the conventional form of content analysis, and names it the Consolidated narrative interrogation method. The method is to be seen as a combination of the mechanistic and interpretative approaches to content analysis. Where the former , focuses strictly on volumetric and or frequency measurement and the later instead takes on a more "meaning oriented" form, i.e focus is on identifying

the underlying meaning and themes of the words in question. With the aim of obtaining an in-depth understanding of what is communicated and how.

The method is used to analyze disclosure content for diversity and depth. Differing from traditional binary index scoring systems, CONI utilizes a matrix approach to record various variables related to disclosure content. In the original paper Beck et al. (2010) draws from established categories and incorporates new sub-categories from a pilot study. CONI allows for both quantitative and qualitative assessment of disclosures, offering a thorough evaluation of information content and character.

For the purpose of this paper however, a slight modification of the CONI-method was done. That is, as opposed to formulating pre-determined categories and sub-categories based on previous literature etc. We instead used the NLP-analysis and it's accompanying word list to highlight potential points of interest in the reports, this is further explained in the following section. With regards to the consecutive steps, they follow the original version of the CONI method (Beck et al., 2010).

3.3.3 Modified Consolidated Narrative Interrogation Method

Step 0: NLP Term generation - Hot-spot identification

Drawing on the NLP-analysis initially conducted, a series of relevant terms was derived from the data corpora, i.e the extracted textual data from the NFRs (Part 1, Final step, Figure 3.1). These terms where then used as search terms when conducting step one and two of the CONI method. Observing the NLP-analysis output, we could, based on number of occurrences and the development in frequency over time find what we refer to as hot-spots. This step gave us the 6 reports of the initial 30 that where deemed to need further examination.

Step 1: Coding content diversity

For the first step of the CONI method, all instances of the chosen search terms (from step 0) based on the number of occurrence and indication of a trend or development, where extracted together with its context (Part 2, Step 1, Figure 3.1). The context is represented by the 50 words before and after the term instance. To extract this, a python script has been developed (Rafstedt & Lidvall, 2023) that takes each mentioning of a word and extract the 50 words before and after it and put the result in a list which finally is exported to excel. The resulting excel dataset is then humanly coded for disclosure content by the authors following an open coding process, assigning codes based on the underlying meaning/subject of the given disclosure instance. Hence, in difference to the original method developed by Beck et al., 2010 where main-categories are defined and search words is used to find where the main categories are mentioned, this thesis version of the CONI-method already have a pre-defined search word, which is then analyzed in the context of the paper in regards to which main-category it is mentioned in.

Step 2: Coding on information scale

After coding for content diversity in step 1, the same set of disclosures for each firm was coded on the information type scale (Beck et al., 2010). Also by manually by the authors (Part 2, Step 2, Figure 3.1). Each disclosure was given a rating of 1-5 based on the type of reporting (Table 3.2). Where low scores on the scale indicate lower quality disclosures, predominantly narrative in form. In contrast the higher end of the spectrum represents a high level of disclosure quality, where a given subject is both numerically, narrative and comparably disclosed.

Disclosure Type	**Definition**	**Examples**
1	Disclosure addresses issue related to category definition; pure narrative	"...to create modern cars that meet the travel needs of the population while reducing the societal and environmental impact as much as possible..." (Volvo Cars, 2013)
2	Disclosure addresses issue related to category and provides details; pure narrative	"The irregularities in the handling of emission tests contradict everything that we stand for. We regret this immensely and are aware that we have let our stakeholders down. We will do everything in our power to prevent incidents of this kind from reoccurring..." (Volkswagen, 2016)
3	Disclosure addresses issue related to category in numerical way; purely quantitative	"...For remanufactured product lines , average raw-material usage is reduced 60-95% while CO2 emission are cut 30-50% compared with new-part production..." (Groupe PSA, 2021)
4	Disclosure addresses issue related to category in numerical way, including qualitative explanations; narrative and quantitative	"...Since 2018 , we have achieved a 9.5 per cent reduction per average vehicle. The result is in line with our expected trajectory towards our cli- mate ambition. We saw a significant reduction in our tailpipe emission thanks to strong demand for our Recharge vehicles. The fully electric vehicle (BEV) proportion of our global sales will continue to increase..." (Volvo Cars, 2021)
5	Any numerical disclosure to the category including qualitative statements demonstrating year comparisons; narrative, quantitative and comparable	"...to well over 40 % by 2030 and are therefore within the current Administration ' s target range . 0 20 40 60 80 100 120 140 160 147 151 144 158 155 [1] [2] 2021 2020 2019 2018 2017 in grams per kilometer by model year..." (Volkswagen, 2021) [Table format]

Table 3.2: Disclosure Type Information Scale CONI Method (Beck et al., 2010)

Step 3: Volumetric measurement

The final step of the CONI-method is the volumetric measurement. In this instance, the frequency distribution of disclosure content category, and disclosure type is computed and visualized (Part 2, Step 3, Figure 3.1). This steps lets us determine what categories that are given more or less space in the reports, and how that may have changed over time and across firms. The disclosure volume could be seen as a proxy for disclosure importance, at least from the perspective of the firms.

3.4 Research Quality

As presented earlier, this thesis seeks to examine the development of non-financial reporting practices and the main drivers of change in the European automotive industry over the last decade. In terms of the level of generalization, it can be argued that the conclusions inferred on the industry may be of lesser validity. This due to the relatively small sample of three studies companies, however a counter argument to that position is the fact that these three actors, mainly Volkswagen AG and Stellantis represent such a large portion of the European car market (Bekker, 2023).

To make sure the research is of high reliability, several measures to ensure the quality of our research design and methodology has been taken. As discussed above, the fact that we are two researchers in analyzing the sustainability reports, both have jointly formulated clear instructions and criteria for analyzing the reports to avoid any inconsistencies. With the objective of ensuring robustness of the manual analysis, the coding process was done with the researchers sitting together and jointly discussing the process when starting on a new key word. There after we continued individually but constantly having the ability to discuss uncertainties with the other researcher. Furthermore, the same NLP script and settings for each analysis is used to avoid any discrepancies that may arise from using different scripts. Additionally the source code and all data will be open sourced and available for future researcher to replicate, at least the NLP part of the study in the exact manner as here. Lastly, we have established clear criteria for selecting which reports to analyze to ensure that the analysis is consistent across all reports, i.e the non-financial reports or integrated reports. These measures taken are well discussed but are all in this case inspired by (Creswell, 2014) who states that ensuring the reliability of a study is essential for establishing credibility in the given research.

3.5 Limitations

As mentioned, it was not possible to gather all 30 reports for analysis due to some reports not being available online. Despite this obstacle, we maintain that it does not substantially undermine our study given that the primary aim is to evaluate the development over the past ten years. In other words, missing a few years does not mean that the general trend is not captured. However, it is worth noting that this limitation could potentially lead to overlooking certain subtleties or specific reactions if they were encapsulated in the absent reports, which potentially could improve our findings. That said, our results in their current form are not necessarily compromised due to the lack of some reports. Rather, the inclusion of these missing reports might have provided an opportunity for improving our findings further.

Another limitation is the ESG keyword list (Appendix 1). The study is limited by the list in the sense that only developments which is related to the words in the list will be identified. Hence, if any words of substance was not included in the list, the development would be missed out on. However, in the same fashion as the missing reports, missing words in the list do not implicate that the findings that we have are lacking. Rather, including any words that are currently potentially missing in the list could have enriched our findings.

Result & Analysis

The following chapter presents the result of this study. Firstly, the results from the NLP-section and the CONI analysis are presented, including analysis and remarks from the initial result. Then, the results are analyzed in conjunction with that the answers to the research questions are presented.

4.1 NLP Analysis

4.1.1 Key Word Frequency Analysis

The results of the NLP pre-study is presented through three heat-maps. The heat-maps in their entirety can be viewed in (Appendix 3). However, in this section, a compact view of the three respective heat-maps (Figure 4.1, 4.2, 4.3) will be discussed where only the words chosen for qualitative analysis are highlighted. The green color scale indicates the frequency of the term, where the darker shade represents the highest numbers. The opposite y-axis lists all examined words and each column represents a given reporting year on the x-axis.

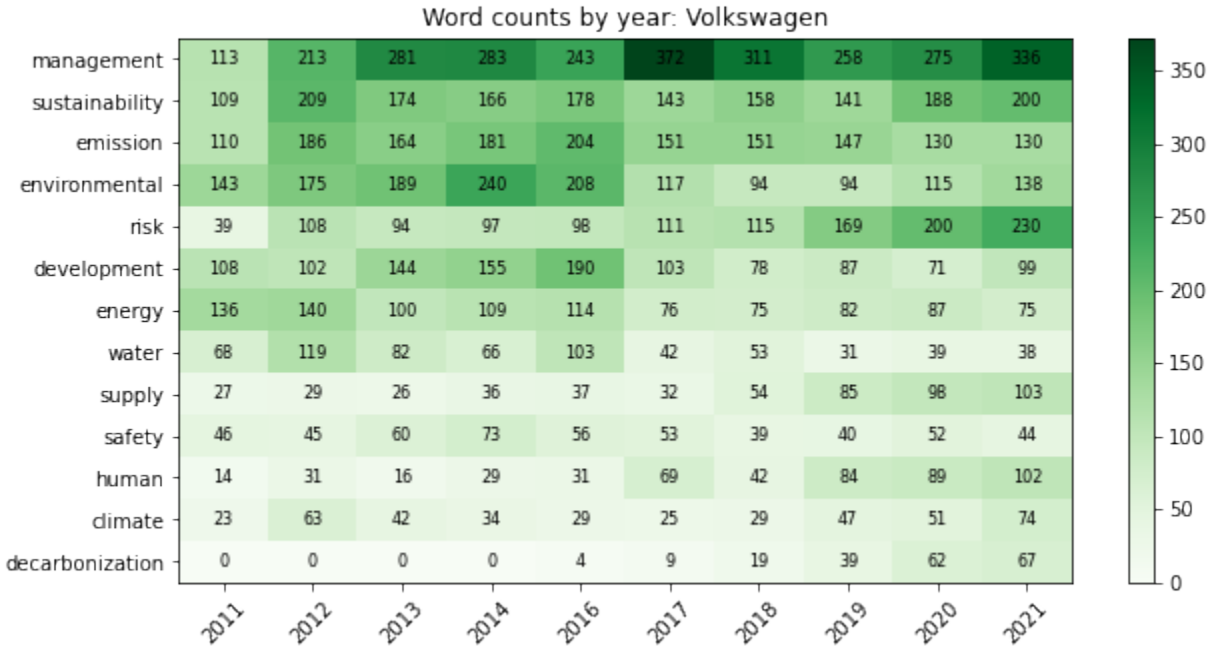

Figure 4.1: Word count by year, Volkswagen

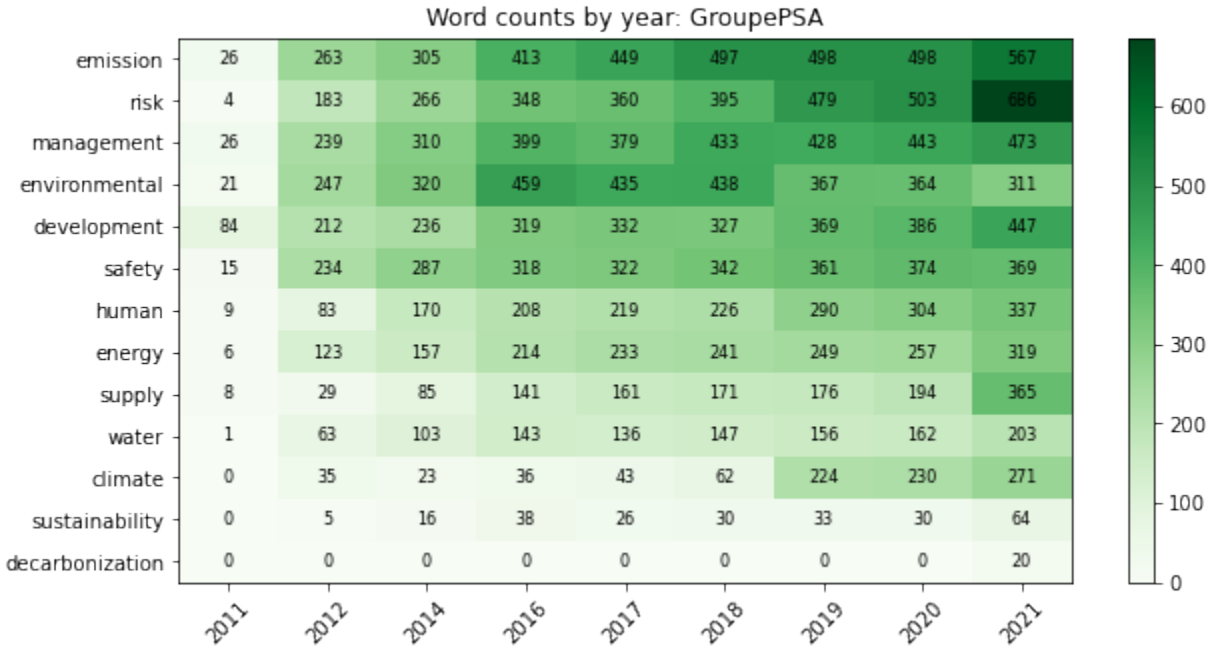

Figure 4.2: Word count by year, Groupe PSA

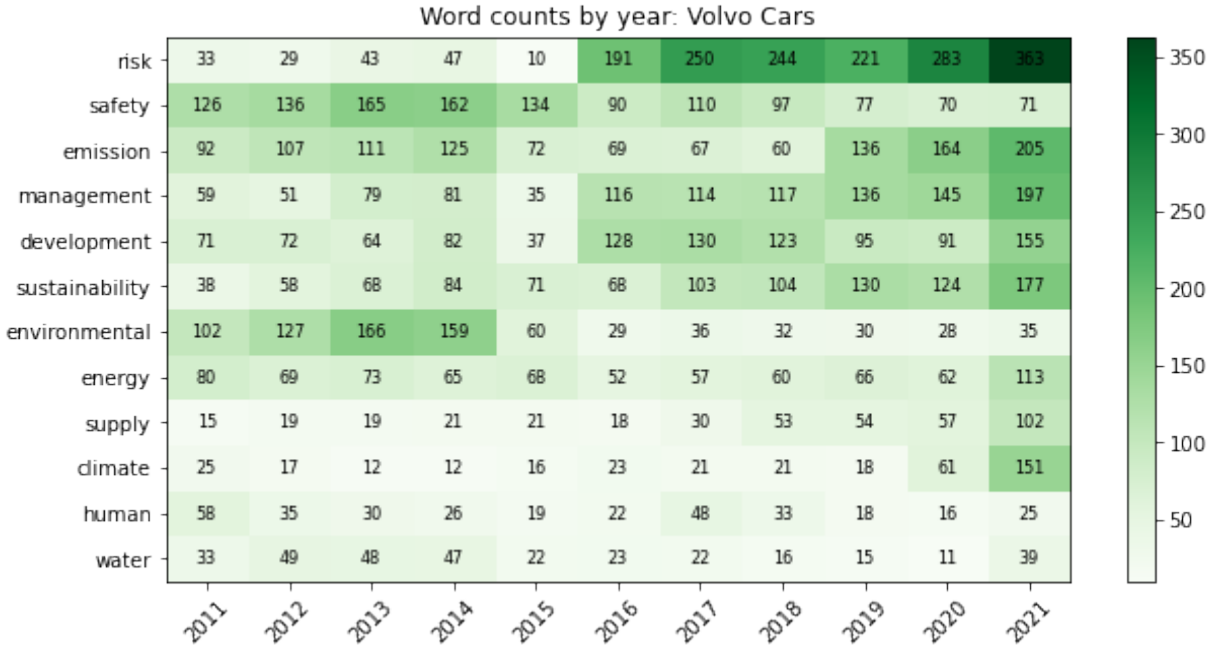

Figure 4.3: Word count by year, Volvo Cars

The words that has been selected for further analysis are *risk*, *development*, *emission*, and *environmental*. Whilst it could have been relevant to include more words in the qualitative analysis. These four broad terms and their respective frequency and change over the period are deemed to be enough to shed light on how non-financial reporting has developed in the industry over time. Bellow follows the specific motivation for each selected term.

Selected Words:

Risk - was selected for further qualitative analysis since it both had a high number of mentions across all firms as well as showing a distinct increase in its amount of mentions over time (Figure 4.1, 4.2, 4.3) Furthermore, it is not obvious as to why risk incrementally have increased over the examined time period.

Development - was selected for further qualitative analysis since it is for one highly mentioned across all firms (Figure 4.1, 4.2, 4.3). However, whilst the frequency show clear patterns over-time for all firms, the pattern is not the same for all firms where Volkswagen (Figure 4.1) have noticeably decreased their use of the word from 2016-2021 whilst Volvo Cars and GroupePSA have gone in the opposite direction (Figure 4.2, 4.3).

Emission - was selected for further qualitative analysis since it is frequently mentioned across all firms (Figure 4.1, 4.2, 4.3) and should show how the trend of electrification is expressed in the different firms reports. Further, the over-time frequencies of the word show a high amount of variation where it is incrementally increasing for GroupePSA (Figure 4.2), decreasing for Volkswagen (Figure 4.1) and (with some nuance) overall increasing for Volvo Cars (Figure 4.3) as well.

Environmental - was selected for further qualitative analysis since it captures which environmental efforts each firm focuses on. Likewise, environmental is frequently mentioned across all firms and show interesting over-time patterns (Figure 4.1, 4.2, 4.3).

The following terms, while noteworthy, were ultimately excluded from the in-depth analysis, They presented some initial interest, particularly due to their frequency. However, upon closer examination, the relevance of these terms was either indirect, unclear, or overshadowed by the chosen four key terms. The decision to exclude these words was considered, taking into account their trends over time, patterns across companies, specific applications, and potential to provide insights. In some cases, the word's usage was either too broad or too niche to provide valuable results. While these words were not chosen for the detailed analysis, they offer supplementary context for understanding the non-financial reporting development in the automotive industry. Their individual motivations for exclusion are outlined below.

Considered Words:

Safety - was not selected for further analysis since it is a bit unclear how it relates to sustainability. Further, whilst being highly mentioned and showing interesting trends at Volvo Cars (Figure 4.3) and GroupePSA (Figure 4.2), it was not a very frequent word in Volkswagen's reporting (Figure 4.1).

Management - whilst being very highly mentioned (Figure 4.1, 4.2, 4.3), was not selected as it is not obvious based on the trends and mentions how it relates to sustainability. Further, whilst doing some initial analysis of the reports, it was found that management most often were mentioned in conjunction with risk (i.e. "risk management"), hence, some of the nuances found in management is expected to be identified by further analyzing the word "risk".

Sustainability - was strongly considered for further analysis. Naturally, the word could be interesting whilst analyzing sustainability reports. However, initial analysis of the reports showed that the word was mainly used in a broader sense and was rarely applied in specific scenarios, which would generate deeper analysis futile. Furthermore, whilst Volvo Cars (Figure 4.3) and Volkswagen (Figure 4.1) make frequent use of the words, Groupe PSA (Figure 4.2) barely mentions it.

Energy - was considered on a similar basis as "emission", i.e. that it could capture the electrification of the industry. However, whilst energy showed modestly more stand-out patterns, it had substantially lower frequencies of mentioning (Figure 4.1, 4.2, 4.3).

Supply - was considered as it captures the firms supply chains and as it showed strong patterns of incremental increase by all firms (Figure 4.1, 4.2, 4.3). However, the word is somewhat niche and would not be likely to capture more other trends than supply-chain trends.

Climate - was mainly considered due to its sudden spike in GroupePSA in 2019 (Figure 4.2) and Volvo Cars in 2021 (Figure 4.3). However, climate is arguably a subcategory of "environmental". Hence, the sudden rise in use of the word climate will likely be brought forward in the analysis of the word "environmental"

Human - was considered mainly to the purpose of capturing the social aspects of sustainability. However, the lack of general mentions in Volkswagen (Figure 4.1) and Volvo Cars (Figure 4.3) was the main factor for excluding the word. Further, the amount of mentions of the word "human" itself is to an extent enough analysis as its not easy to sub-categorize the word.

Water - similarly to "human", water was mainly excluded due to a general lack of mentions and a general skepticism towards what could be found from further analysis of the word since "water" can have very little meaning besides the sustainable use of water in a non-financial report.

Decarbonization - was considered since it had an over-time trend which stood out in Volkswagen (Figure 4.1). Further, the inclusion of the word could be a strong indicator of which sustainability strategy that is imposed. However, the word had no mentions in Volvo Cars (Figure 4.3) reporting.

Report selection

The key word frequency analysis (Figure 4.1, 4.2, 4.3) rendered the possibility to identify hot-spots in the decade long timeframe of the sample, where as described previously word frequencies indicative of a change or development was chosen. The same process went into deciding on which reporting years to choose in order to capture the indicated trend. Table 4.1 gives an overview of the two selected reports for each key word and company.

	Risk		Development		Emission		Environmental	
Volkswagen AG	2014	2021	2016	2021	2016	2021	2014	2021
Groupe PSA	2014	2021	2012	2021	2012	2021	2016	2021
Volvo Cars	2014	2021	2013	2021	2011	2021	2013	2021

Table 4.1: Selected Reports After Key Word Frequency Analysis

With regards to the word risk, the 2014 and 2021 reports where chosen for all three firms since in general, though most prominent for Volkswagen and Volvo Cars, the frequency starts to increase substantially around 2014 and remains high relative to the starting point in the 2021 report. For the word development, the frequencies where less similar across the companies, where a sharp decline could be seen for Volkswagen when comparing the 2016 and the 2021 reports. In contrast, Volvo Cars and Groupe PSA shows the opposite trend with a increase in frequency mainly between 2012/2013 and 2021 respectively. Looking at the word emissions, there is no real similarities in terms of trend for the companies though Volkswagen has yet again shown a sharp decline from the 2016 report and on wards leading to the choice of 2016 and 2021. Volvo Cars has gone from low frequencies in the earlier years to high in latter where 2011 and 2021 makes out two extreme points. Groupe PSA showed a high frequency early on but increases rapidly to almost 600 in the 2021 report, thereby we settled on the 2012 and 2021 reports to examine the start and end of this development. With respect to the word environmental, both Volkswagen and Volvo Cars have high frequencies in the first half of the 10 year timeframe thus 2014, 2013 and 2021 where chosen respectively. Groupe PSA however has their peak in 2016 and subsequently reduces their frequency up until 2021.

4.1.2 Word Volume Analysis

The results of the word volume analysis is shown in Figure 4.4. The results shows that GroupePSA and Volvo Cars have significantly increased their reporting volume whilst Volkswagen only has had a modest increase over the period. However, Volkswagen shows a trend that the volume is increasing with the outlier between the years 2016-2017 which will be discussed later in this paper. The word volume analysis does not in itself say anything more than what has been stated, but it will be used to complement the other results of this thesis to provide more context to the developments.

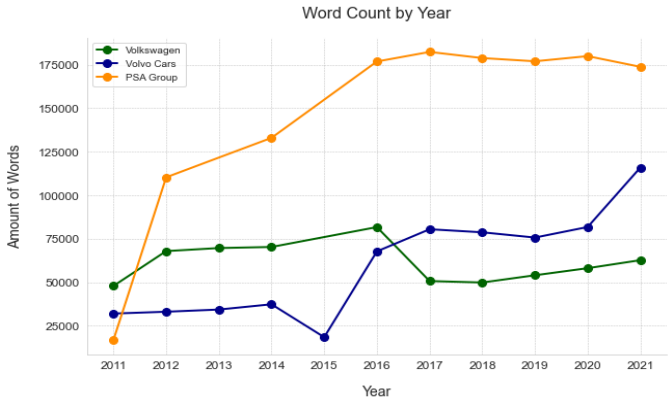

Figure 4.4: All Companies Word Volume by Year

4.2 CONI

In this section, the results for each key word will be presented. For each term, there is first a walk-through of the content diversity coding and the resulting content categories (Step 1). Thereafter we present the disclosure type per category (Step 2) in conjunction with the volumetric measurement for the content categories (Step 3). See 3.3.3 for process details.

4.2.1 Risk

When coding disclosures for content diversity based on the key word risk, the main 8 identified categories was; Risk Management, Social, Sustainability, Legal, Supply Chain, Transitional, Operational, and Environmental. Each of the mentioned categories was formed by grouping the subcategories (codes) used during the coding process.

Categories and sub-categories

Category	**Sub-category (codes)**	**Definition**
Risk Management	Management Risk Analysis Risk Mapping ERM (Enterprise Risk Management)	Any disclosure related to how the given company manages and handles various risks.
Social	Health and safety Human Rights Employee satisfaction	Any disclosure related to identified risks concerning social issues, such as health and safety in the workplace, and employee satisfaction.
Sustainability	Sustainability CSR (Corporate social responsibility)	Any disclosure related to identified risks connected to sustainability practices and CSR initiatives.
Legal	Compliance Legislation Regulation	Any disclosure related to the risks surrounding compliance with legislative and regulatory requirements.
Supply Chain	Suppliers Supply chain disruptions Shipping, Logistics Production facilities	Any disclosure related to the management of risk related to the supply chain, including suppliers, handling of disruptions, and logistics.
Transitional	Development, Trend Technological, change Risk with a term limit	Any disclosure related to identified risks in relation to trends and technological changes.
Operational	Product Production Vehicle technology Innovation, R&D	Any disclosure related to the risks connected to operations, including product development, production, vehicle technology, and R&D.
Environmental	Environment Climate Nature, Ocean Ecological, Biodiversity, Emissions	Any disclosure related to the risks connected to the company's environmental practices and its impact on climate and other ecological factors.
Annual Report	Information non-related to NFR	Any disclosure involving risks in that is strictly attributable to financial reporting.

Table 4.2: Content Categorization, Risk

As detailed in Table 4.2 *Risk Management* represents any disclosure involving the term risk that relates to how the firm manages and handles various risks, that is, general strategies and processes. The *Social* category encompass risks in relation to health and safety in the workplace, employee satisfaction and human rights concerns. Where as, the *Sustainability* category relates to firm disclosures that specifically involves discussion of risks in relation to sustainability and overall CSR initiatives. Furthermore, there is the category of *Legal*, that refers to risks in relation to potential issues regarding firm compliance with the legislative and regulatory requirements imposed on company's in general and the automotive industry in particular. From a more internal perspective, the *Supply Chain* , *Transitional* and *Operational* categories refers to risks that signify certain challenges within a company. *Supply Chain* risks relates to elements associated with the whole supply chain, including individual suppliers and logistics. *Transitional* risks relate to developments that possess a term limit, essentially indicating their transient, or over-passing, nature. Finally, *Operational* risks disclose potential issues connected to the company's operations, which include aspects like product development, production, and research and development (R&D). Additionally there is the category of *Environmental*, which encompass risks related to potential problems that may arise form the firms activities from an environmental perspective, including its impact on climate and other ecological factors such as biodiversity and emissions. Lastly an inclusion of the category *Annual Report* was done to capture the disclosures surrounding risk that was clearly attributable to financial reporting and not specifically related to NFR. This category was mainly prevalent in the cases where the given firm produces an integrated report.

Qualitative & Quantitative Results

Volkswagen

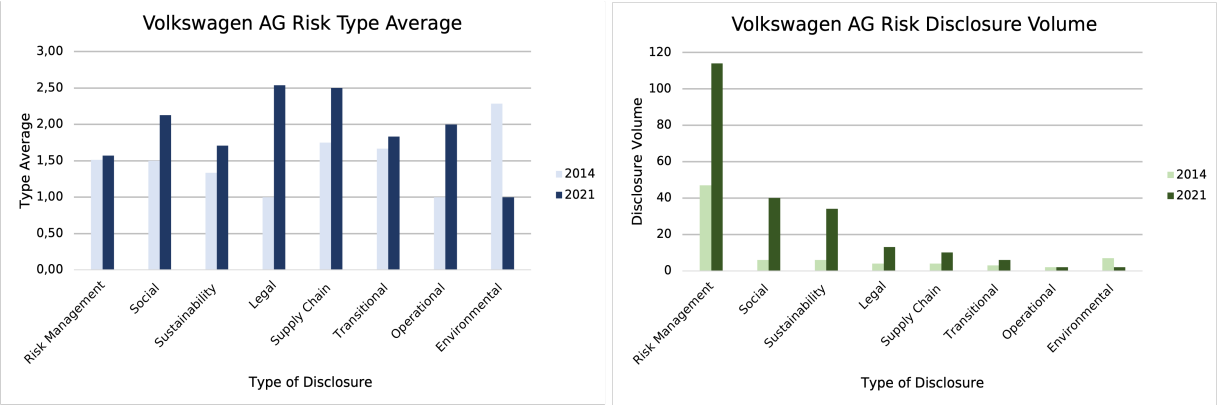

Figure 4.5: Volkswagen Risk Type Average & Disclosure Volume

In regards to risk, Volkswagen have between 2014-2021 more than doubled the frequency of its discussions surrounding risk management. Further, Volkswagen has started to discuss risk more closely correlated with the areas social, sustainability and legal. All the same, the total amount of words in the report has decreased from approximately 70 000 in 2014 to 63 000 in 2021 (Figure 4.4).

In the relevant categories, there has been little change in the types of discussion which has been held, with the exception of legal where they in 2014 had a average type of 1 which increased to 2.5 in 2021, indicating that Volkswagen discloses more numbers and examples in regards to their legal risks.

All in all, Volkswagens increased focus on risk during the analyzed timespan, where it has been no regulatory changes, shows that Volkswagen clearly use their sustainability reportings for legitimacy purposes, where arguably risk management strategies are used as a mean to legitimize the firm towards investors to reduce the sustainability risks associated with investing in Volkswagen. Further, it could be argued that they engage in regulatory capture through legitimizing themselves towards regulators by showing responsibility.

Groupe PSA

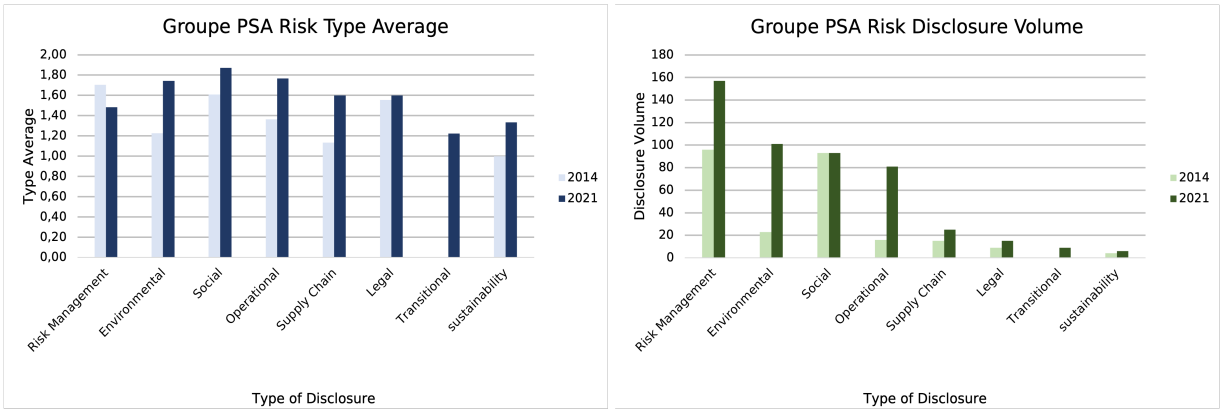

Figure 4.6: Groupe PSA Risk Type Average & Disclosure Volume

Groupe PSA, who already in 2014 had several discussion regarding the risk related to sustainability, still showed a significant increase in these discussions. Especially in regards to the environmental risks and the effects sustainability related risks could have on their operations. However, the type of which Groupe PSA have these discussions have seen little change. But across the board, it has been a slight increase in the disclosure type.

In the same fashion as Volkswagen, GroupePSA has made notable changes in their reportings without facing any changes in what is mandated by them through regulations. Hence, legitimacy appears to drive change in GroupePSA as well. However, whilst there are similarities between Volkswagen and GroupPSA in that both primarily focus on risk management, GroupePSA put substantially higher emphasiz on risk over all and especially on their organizational risks in regards to sustainability. Therefore, it can be said that whilst both firms show positive developments in the use of the word risk and that it appears that legitimacy concerns is the main driver for it, they still differ as to the category of risk they are discussing.

Volvo Cars

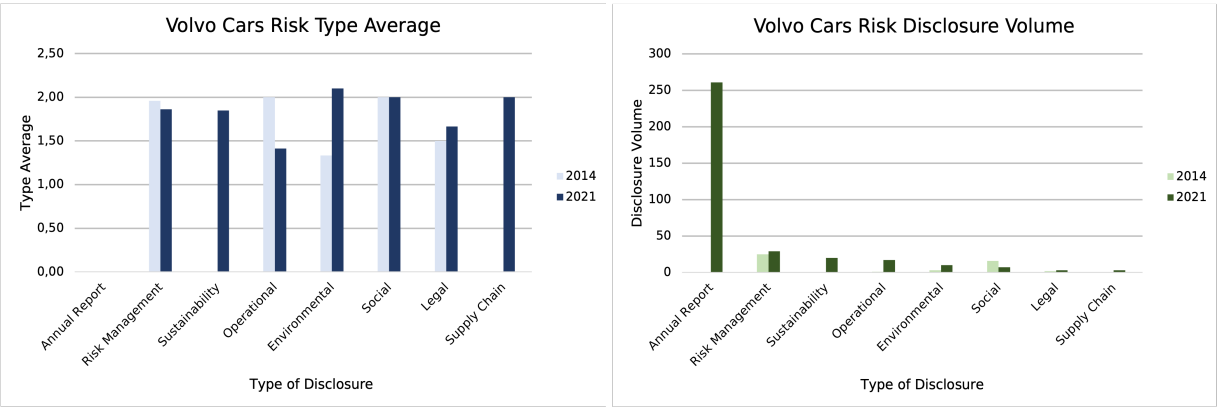

Figure 4.7: Volvo Cars Risk Type Average & Disclosure Volume

Volvo Cars is unique in this regards due to its move to integrated reporting in 2016. Hence, annual report related mentions of risk dominates. However, there are still some modest increases in their discussions surrounding risks in regards to sustainability where Volvo Cars have modestly started to discuss the risk in regards to sustainability, the environment and its effect on Volvo Cars operational capacity.

The type of which Volvo Cars discusses these subjects have seen little to no change between 2014-2021.

Hence, in contrast to Volkswagen and GroupePSA, Volvo Cars has not moved in the direction of notably increasing their discussions regarding sustainability related risk. This could be due to Volvo Cars move towards integrated reporting, however, they still could have incorporated sustainability related risks to a much higher extent then what they did and integrated reporting in itself should not necessarily effect this.

4.2.2 Development

When coding disclosures for content diversity based on the key word Development, the main 9 identified categories was; Technological, Operational, Human Capital, Regulatory, Ecological, Sustainable Development Goals, Electric, Local Communities, and Product. Each of the mentioned categories was formed by grouping the subcategories (codes) used during the coding process.

As outlined in Table 4.3, the *Technological* category encapsulates any disclosure related to the company's technological development, including research and development initiatives and software advancements. The *Operational* category pertains to the development of the company's operational activities and strategies, encompassing elements such as supply chain management, communication processes, and leasing operations. The *Human Capital* category includes the practices and policies relating to the development of the company's employees, covering aspects like talent acquisition, employee training, workplace health initiatives, and employee skills advancement. The *Regulatory* category involves disclosures relating to the

firm's engagement with the regulatory environment, covering areas like compliance efforts, future legislation, and lobbying activities. Under the *Ecological* category, disclosures concerning the company's development with regards to ecological impact and practices are included, touching upon issues related to water management, biodiversity, and interactions with plants and animals. The *Sustainable Development Goals* category involves the company's alignment with the United Nations' Sustainable Development Goals (SDGs), indicating the company's commitment to these goals and their strategies to achieve them. The *Electric* category encompasses disclosures related to the development of electric technologies and initiatives, such as electrification strategies and battery technology advancements. The *Local Communities* category includes disclosures concerning the firm's impact on, and development of, local communities it has a connection to, potentially involving aspects of supply chain management and efficiency efforts within these communities. Finally, the *Product* category includes disclosures related to the development of the company's products, low-emission vehicles, and autonomous technologies, thereby covering strategies, initiatives, and updates in relation to these product developments. Through this coding process, a comprehensive understanding of the firm's diverse array of disclosure content.

Categories and sub-categories

Category	**Sub-category (codes)**	**Definition**
Technological	Research and Development Software	Any disclosure related to the technological development of the given company.
Operational	Management Supply chain Communication Leasing	Any disclosure related to developments in the company's operational activities and strategies.
Human Capital	Talent Acquisition Employee Training Workplace Health Employee Skills	Any disclosure related to development of practices and policies in relation to its employees.
Regulatory	Compliance Future Legislation Lobbying	Any disclosure related to the development of the regulatory environment, including compliance, future legislation etc.
Ecological	Water Biodiversity Plants, Animals	Any disclosure related to developments in relation to ecological impact and practices.
Sustainable Development Goals	United Nations SDGs	Any disclosure related to the company's alignment with the UN's Sustainable Development Goals.
Electric	Electrification Battery	Any disclosure related to the development of electric technologies and initiatives.
Local Communities	Supply Chain Management Supply Chain Efficiency	Any disclosure related to the development and impact of/on local communities.
Product	Product Development Low-emission Vehicle Autonomous	Any disclosure related to the development of company's products, low-emission vehicles, and autonomous technology.

Table 4.3: Content Categorization, Development

Qualitative & Quantitative Results

Volkswagen

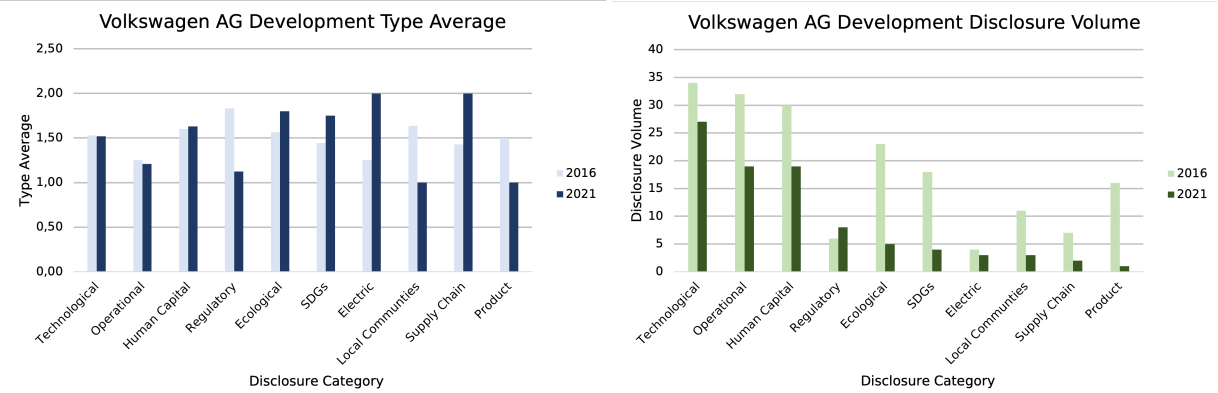

Figure 4.8: Volkswagen Development Type Average & Disclosure Volume

In regards to Volkswagen's utilization of the term "development," there have been no significant changes in any specific areas, except for a general decrease in its mention. The most notable shift is the considerable decline in the use of "development" concerning ecological aspects, as well as a marked decrease in discussions about the Sustainable Development Goals. It is somewhat anticipated that the Sustainable Development Goals were highly discussed in 2016, given their introduction by the United Nations in 2015 (UN, n.d.). However, the reason for Volkswagen's reduced focus on these goals remains unclear.

The type average of Volkswagen's use of the word "development" has maintained relative stability between the two years analyzed, even though the total number of mentions was notably lower in 2016. This suggests that the reduction in the term's frequency is not an indication of a more focused and higher-quality conversation, but rather that there is genuinely less discussion about development at the same level of "quality."

Since no regulatory changes have appeared between 2016-2021 but major changes in Volkswagen's reportings can be observed in regards to development, regulations play no effect in the development and it is rather some way of legitimacy. However, as they decreased their usage of the word "development", which one would expect to be increased in a firm trying to legitimize themselves the "traditional" way, it is not entirely clear how they try to legitimize themselves. However, this is beyond the scope of this study.

Groupe PSA

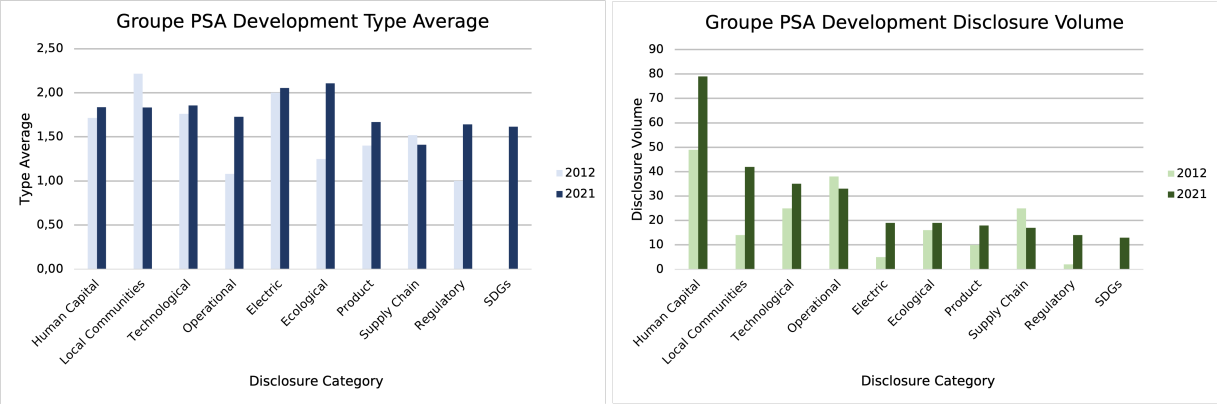

Figure 4.9: Groupe PSA Development Type Average & Disclosure Volume

On average, the type average of GroupePSA saw a slight increase over the analyzed time period, even though the total amount of words also increased. The increase was especially noteworthy in the area if ecology where more concrete examples of their efforts were discussed, and in the area of regulatory concerns where GroupePSA put emphasis on being a part of the development of future regulations which would affect them.

Lastly, GroupePSA has had a significant focus on their discussions surrounding the development of Human Capital and local communities, which both saw notable increases in the analyzed time period. In regard to human capital, the discussion was mainly revolving around how the firm's employees should be trained in the realm of sustainability, and in regard to local communities, GroupePSA seemed to put a lot of emphasis on topics such as local sourcing to develop the communities of their suppliers.

In the case of GroupePSA, there have been regulatory changes in the analyzed time-period through the introduction of the NFRD. The categories which is affected by the NFRD is mainly "Local Communities" and "Ecological" which both had substantial and adequate in discussions in relation to what is mandated by the NFRD even before the regulations came into effect. Hence, GroupePSA's overall development in regards to the use of the word "development" can likely be attributed to legitimacy concerns.

Volvo Cars

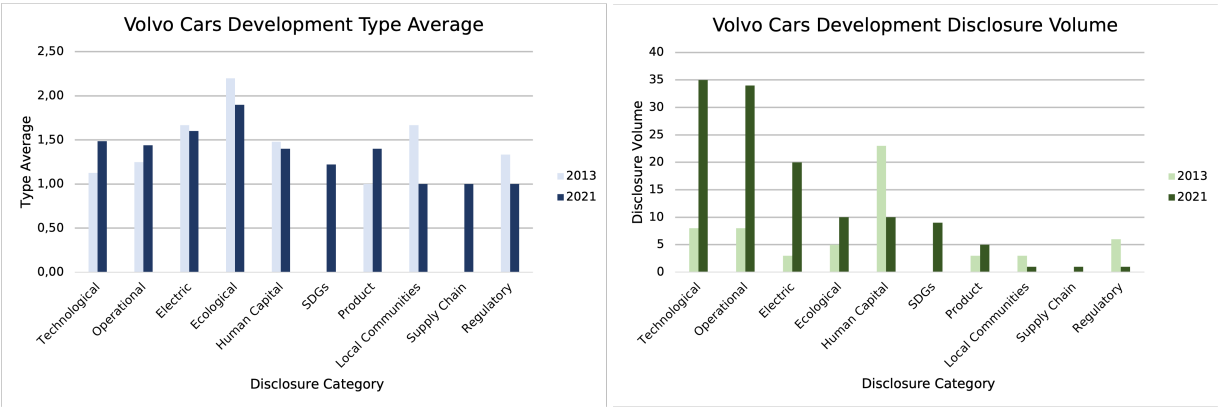

Figure 4.10: Volvo Cars Development Type Average & Disclosure Volume

In contrast to Volkswagen and partly GroupePSA, Volvo Cars experienced a substantial surge in their overall utilization of the word "development." This increase primarily resulted from heightened discussions around technological and operational advancements, as well as a growth in conversations about electric vehicle development, which is not particularly surprising. In summary, the 2021 usage of the term "development" predominantly revolved around the development of novel technologies at Volvo Cars and the operational management strategies in their new sustainable business model, which aims to be entirely electric by 2030. However, another notable development is the significant decline in discussions regarding human capital development. Generally, one would anticipate an increase in this area over time, and even more so in Volvo Cars' case, given their adoption of integrated reporting, which not only encompasses human capital within the realm of sustainability.

The average type for Volvo Cars, much like for Volkswagen, has remained relatively stable even as the total word count has risen considerably, suggesting that the discourse on development has maintained consistent quality but on a larger scale.

As previously discussed in the section about GroupePSA, the NFRD should mainly effect the categories "Human Capital" and "Ecological". Further, similarly to GroupePSA, the NFRD came into effect during the analyzed time-period. However, the NFRD appears to have had little to no effect of Volvo Cars reportings as there is very little effect on the disclosure type and especially in the case of Human Capital, Volvo Cars even substantially decreased their discussions.

4.2.3 Emission

When coding disclosures for content diversity based on the key word Emission, the main 10 identified categories was; Production, Supply Chain, Product, Regulatory, Pollutants, Objectives, Operational, Sector, Management, and Reduction. Each of the mentioned categories was formed by grouping the subcategories (codes) used during the coding process.

Categories and sub-categories

Category	Sub-category (codes)	Definition
Production	Manufacturing Remanufacturing, Production EV-production, Materials	Any disclosure related to emissions attributable to production activities and strategies.
Supply Chain	Supplier(s) Supply chain emissions	Any disclosure related to the company's supply chain connected emissions.
Product	EV ZEV Synthetic diesel fuels Driving emissions Electrification	Any disclosure related to the role in emissions reduction the company's products, including electric vehicles, zero-emission vehicles, synthetic diesel fuels, driving emissions, and electrification can play.
Regulatory	Emissions trading system (ETS) Emission standards Compliance, Regulation Credits, Pools, Taxes Product liability compliance	Any disclosure related to emissions with regards to the regulatory environment, including emissions trading, caps, credits, pools, and emission-based taxes and rights.
Pollutants	NOx, SOx, SO2, CO2 VOC, Hydrofluorocarbons Particulate	Any disclosure related to emissons as in the specific pollutants produced by the company.
Objectives	UN 2030 SDGs Problematization Industry challenges Targets	Any disclosure related to emissions and their relation to firm objectives, including alignment with the UN 2030 SDGs, problematization and targets.
Operational	Carbon pricing Operational, Operations Dieselgate	Any disclosure related to emissions attributable to operational activities and strategies.
Sector	Vehicle, Market trends Industry shift Green steel	Any disclosure of emissions related to the sector or industry as a whole, including vehicle market trends, industry shifts.
Management	Stakeholder importance Internal policy Communication	Any disclosure related to the management practices, including stakeholder importance, internal policies, and communication with regards to emissions.
Reduction	Decarbonization Reduction, reduce Impact Environmental action	Any disclosure related to the firm's efforts to reduce its emissions, including decarbonization.

Table 4.4: Content Categorization, Emission

As illustrated in Table 4.4, the *Production* category involves any disclosure concerning emissions tied to production activities and strategies, encapsulating elements like manufacturing, remanufacturing, EV-production, and the materials used. The *Supply Chain* category relates to disclosures of the emissions connected to the company's supply chain. The *Product* category includes any disclosure referring to the role the company's products, such as electric vehicles (EV), zero-emission vehicles (ZEV), and synthetic diesel fuels, can play in reducing emissions. The *Regulatory* category pertains to disclosures associated with emissions in relation to the regulatory environment, including elements like the Emissions Trading System (ETS), emission standards, and compliance regulations. The *Pollutants* category captures

disclosures related to specific pollutants produced by the company, such as NOx, VOC and Hydrofluorocarbons, and particulate matter. The *Objectives* category involves any disclosure related to emissions in relation to the company's objectives, including alignment with the UN 2030 Sustainable Development Goals (SDGs) and set emission reduction targets. The *Operational* category includes any disclosure linked to emissions attributable to the company's operational activities and strategies, such as carbon pricing efforts. The *Sector* category refers to any disclosure of emissions connected to the broader sector or industry, including automotive market trends and industry shifts. The *Management* category encapsulates any disclosure related to management practices concerning emissions, including stakeholder importance, internal policies, and communication strategies. Finally, the *Reduction* category incorporates disclosures related to the firm's specific efforts to reduce its emissions, highlighting strategies such as decarbonization.

Qualitative & Quantitative Results

Volkswagen

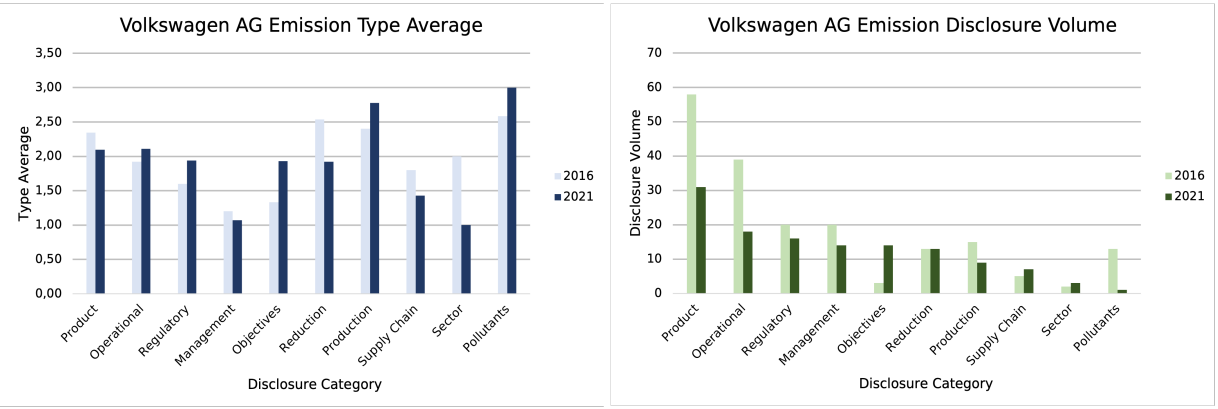

Figure 4.11: Volkswagen Emission Type Average & Disclosure Volume

With respect to the word emission, Volkswagen has between 2016-2021 reduced their frequency of discussing emissions in relation to their products by approximately half. The same trend can also be observed in the area of emissions from a more general operational perspective. Discussions and disclosures on specific pollutants is drastically lower frequency wise in the 2021 report. The only subject area where the firm has increased their reporting frequency is the that of objectives, i.e discussions related to emissions targets, standing by the Paris Agreement etc. (Table 4.4).

Looking at the type of disclosures, the differences are of less magnitude in general however the discussions of emissions from a sector perspective gone from an average type of 2,5 to 1 i.e the company has become less specific and numerically bound in their disclosures in this area and leaning more towards the more purely narrative side. The opposite can be said regarding objectives and specific pollutants, here the firm uses numerical data to a greater extent in their 2021 report compared to in 2016.

The decreasing development in regard to Volkswagen's emissions could be argued that it is attributed to legitimacy. In theory, it is common for firms to distance themselves in relation to their scandal as a legitimization strategy. Hence, "Volkswagen emissions scandal" (2023) could likely bee the explanation for this. However, the development could also be a natural effect of Volkswagen's increasing focus on electric vehicles which simply but emit less emissions and therefore lessens the need for discussions regarding the subject.

Groupe PSA

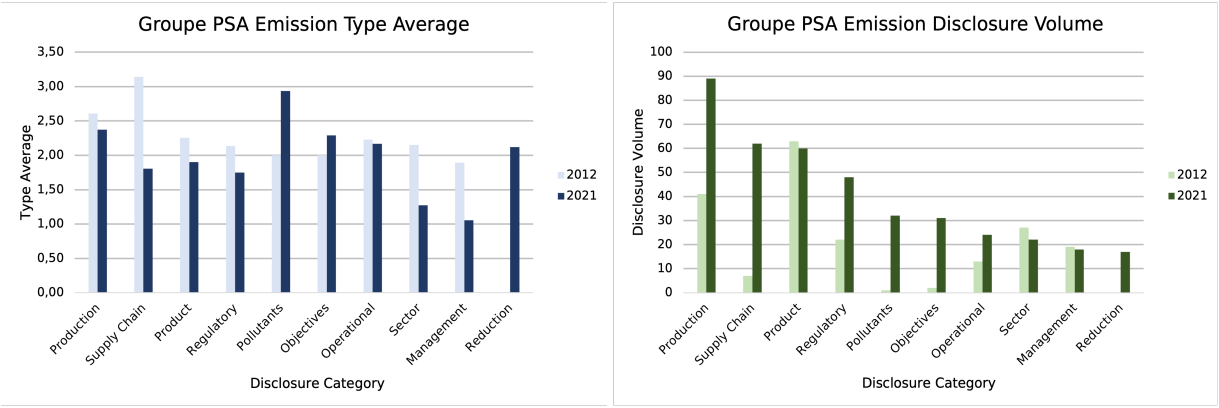

Figure 4.12: Groupe PSA Emission Type Average & Disclosure Volume

GroupePSA shows a general pattern between the years 2012 and 2021 where the disclosure frequency has increased in almost all categories. The most notable being the areas of Production, Supply Chain, Regulatory, Pollutants and Objectives. The largest difference is the disclosure frequency involving emissions related to the supply chain and also reporting of specific pollutants. This shall though be seen in the context that the total volume of words has increased by approximately 60000 words. That is, the company report substantially more information overall in their 2021 report.

The disclosure type differences are less extreme however notable in some areas. The group has increased their average type, leaning more towards numerical, quantitative information within the area of Pollutants and Objectives. The opposite can be said of the areas Sector and management, where the company has shifted to a more narrative disclosure style.

Compared to Volkswagen, GroupePSA have moved in the entirely different direction in regards to their use of the word emission. This could potentially strengthen the argument that "Volkswagen emissions scandal" (2023) was a main driving in Volkswagen reducing their mentioning of the word since GroupePSA also moves towards electric vehicles but this strategy, as shown, does not reduce their discussions surrounding the emission subject.

Volvo Cars

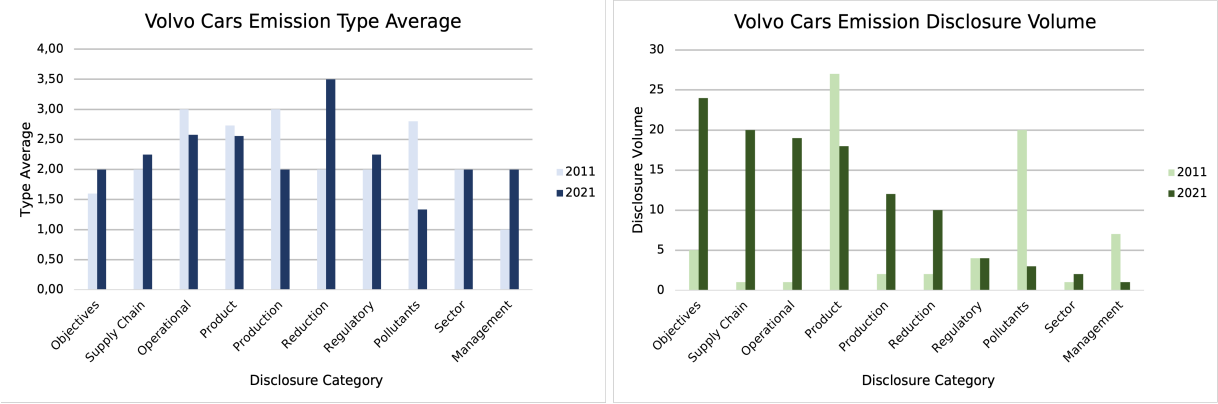

Figure 4.13: Volvo Cars Emission Type Average & Disclosure Volume

Volvo Cars is as noted earlier of particular interest since having moved from dedicated non-financial reporting to integrated reporting between the two observed years (2011, 2021). In terms of disclosure frequency we can see a substantial increase in the categories; Objectives, Supply Chain, Operational, Production. However emissions related to the company's own product has a lower rate of occurrence in the 2021 report. That is, the overall trend in disclosure frequency is that the firm talks more about the emissions attributable to their operations and the production of cars rather then the emissions of cars after point of sale. Perhaps most notable of the sharp increasing categories, is that of objectives, in 2011 when following a more stringent GRI-reporting style the narrative around objectives (goals and targets) amounted to just a fifth of the 2021 frequency. This is most likely in part to due to the overall substantial increase in word volume between the 2011 and the 2021 report (Figure 4.4).

Though having gone through a great transformation with regards to disclosure volume and content category, when observing disclosure type there has not been that drastic of a development. However notable categories are that of Production and Pollutants, where the company is far more narrative and less specific in the 2021 report compared to 2011. On the contrary, looking at the area of Reduction (general strategies and disclosures of emissions reduction (Table 4.4)) a clear increase in the information level of disclosure, where Volvo Cars present a high degree of numerical, comparable data with narrative explanations in the latter report.

Compared to GroupePSA and Volkswagen, Volvo Cars overall increased their use of the word similarily to GroupePSA. However, the specific category in which this increase is observed differ. Hence, comparing the firms it is hard to draw any other conclusion then that they follow different strategies in regards to their emissions reporting.

4.2.4 Environmental

When coding disclosures for content diversity based on the key word Environmental, the main 11 identified categories was; Management, Climate, Regulatory, Supply Chain, Circular, Business Benefits, Communication, Ecological, Technological, Chemical, and Resources. Each of the mentioned categories was formed by grouping the subcategories (codes) used during the coding process.

Categories and sub-categories

Category	**Sub-category (codes)**	**Definition**
Management	Leadership Stakholder importance Internal Policy	Any disclosure related to the company's internal environmental management policies and actions.
Climate	Decarbonization CO2 Greenhouse gases, Leasing	Any disclosure related to climate actions, including efforts to decarbonize and manage environmental impact.
Regulatory	Regulations Lobbying	Any disclosure related to compliance with environmental regulations and legislation.
Supply Chain	Supplier Transports	Any disclosure related to the environmental impact of the supply chain.
Circular	Recycling Remanufacturing Waste management	Any disclosure related to circular economy practices, such as recycling, remanufacturing, and waste management.
Business Benefits	Product improvement Financial benefits Competitive benefits	Any disclosure related to the business benefits derived from environmental initiatives.
Communication	Marketing Impact of marketing material	Any disclosure related to communication of environmental initiatives.
Ecological	Water Biodiversity Plants Anmials	Any disclosure related to the impact on ecology, including water, biodiversity, plants, and animals.
Technological	Product Development Innovation	Any disclosure related to technological developments in the area of environmental sustainability.
Chemical	Refrigerants NOX Other chemicals	Any disclosure related to the management of chemical substances, including refrigerants, NOX, and other chemicals.
Resources	Raw materials	Any disclosure related to the use of raw materials.

Table 4.5: Content Categorization, Environmental

As defined in Table 4.5, *Management* disclosures revolve around the company's internal environmental management policies and actions, including leadership, analysis of stakeholder importance, and general policy. *Climate* related disclosures cover climate actions, such as efforts to decarbonize and manage environmental impact. The *Regulatory* category represents any disclosure involving compliance with environmental regulations and legislation. The *Supply Chain* category addresses disclosures related to the environmental impact of the supply chain, while the *Circular* category encompasses disclosures related to circular economy

practices, like recycling, remanufacturing, and waste management. In the *Business Benefits* category, the focus lies on disclosures related to the business benefits that can be derived from environmental initiatives. The *Communication* category comprises disclosures relating to communication of various environmental initiatives and practices. The *Ecological* category includes disclosures related to the impact on ecology, such as water, biodiversity, plants, and animals. Furthermore, disclosures related to technological developments in environmental sustainability fall under the *Technological* category. The *Chemical* category includes any disclosure related to the management of chemical substances. Lastly, the *Resources* category includes environmental related disclosures attributable to the use of raw materials.

Qualitative & Quantitative Results

Volkswagen

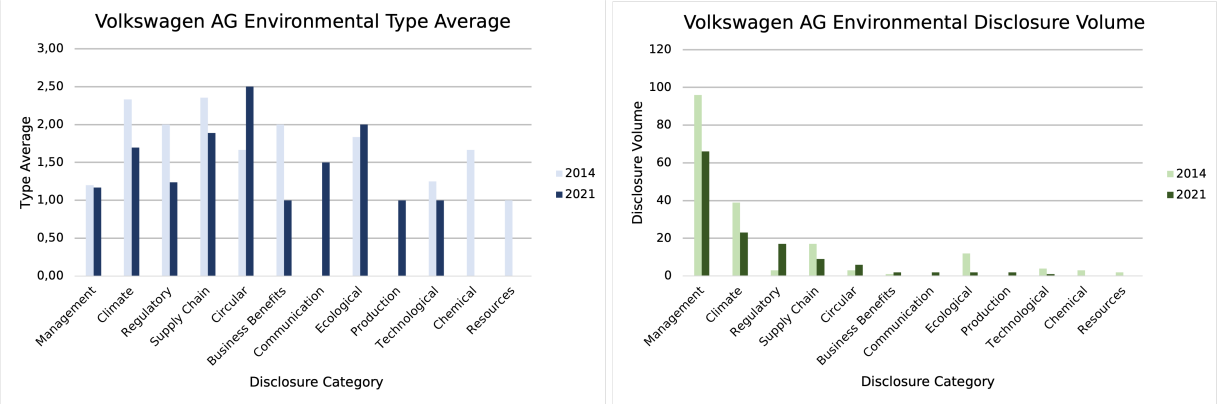

Figure 4.14: Volkswagen Environmental Type Average & Disclosure Volume

For Volkswagen, the discussions revolving the word "environmental" was mostly referring to general management of environmental questions, i.e. the organizational structure, policies, steering documents etc. Besides that, the word environment was across the board less used in 2021 compared to 2014 with the notable exception of it being used in regulatory discussions where it is mainly being discussed in the context of how Volkswagen can adapt to and affect future environmental legislation.

The type average in regard to the word "environment" was on average very low given that the category "management" is both very low type and very frequent.

Again, the decrease in mejtionings is likely not explained by regulations as the NFRD mandates that environmental disclosures should be made and not the other way around. Hence, Volkswagen disclosed more than enough even before the regulations came into effect and the development have more likely been driven by legitimacy concerns. However, it should be noted that the increased in the "Regulatory" category means that Volkswagen are concerned with the regulations that will be imposed on them in the form of the CSRD, however, it is not clear if this is because it will effect their reporting or if it is due to regulatory capture.

GroupePSA

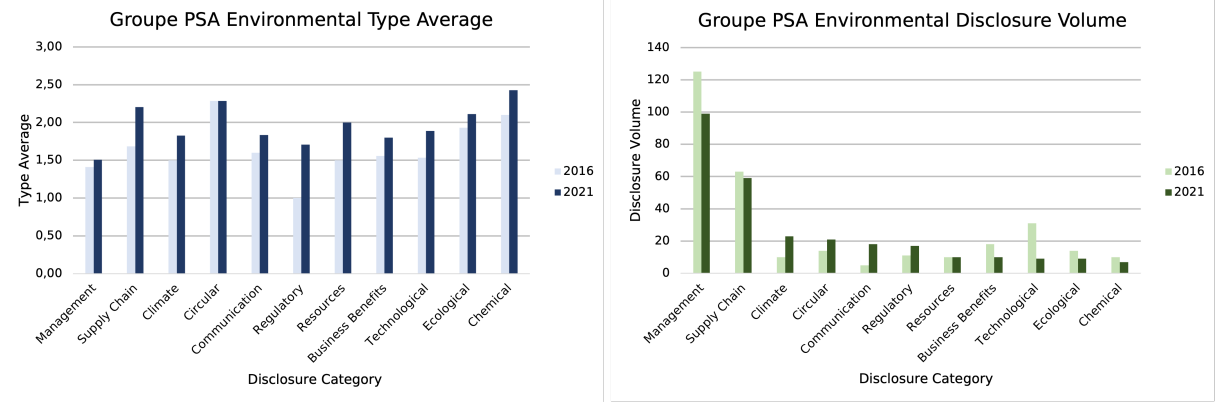

Figure 4.15: Groupe PSA Environmental Type Average & Disclosure Volume

In the same fashion as for Volkswagen, the dominant category for GroupePSA in regards to the word "environmental" is management. However, what stands out in the case of GroupPSA is that supply chain is fairly common as well. This is in line with the other discussed words where GroupePSA has showed a strong focus on their supply chain and there suppliers in all cases. The main difference between 2016 and 2021 in the case of GroupePSA is that they have shifted some focus from general management to more "niche" categories such as climate, circular, and communication. In their 2021 reportings, communication stood out since they in dept discussed the environmental impact of their communications (i.e. the environmetal impact of their social media channels, file sizes in emails etc.). Further, the discussion about environmetal regulations also increased between 2016 and 2021, which is the same as in the case of Volkswagen and Volvo Cars.

Regarding the type average, GroupePSA's reporting had generally higher disclosures types than in 2021 than in 2016. Combining this with the fact that there total usage of the word environmental decreased, it is indicative that disclosures are somewhat more condensed in 2021 than in previous years.

Overlooking some differences regarding which categories is discussed, GroupePSA's development in regard to the word environmental do not differ substantially from the development seen in Volkswagen. Hence, similar arguments can be made in regards to GroupePSA that regulations have played little effect and that the development is most likely driven by legitimacy concerns.

Volvo Cars

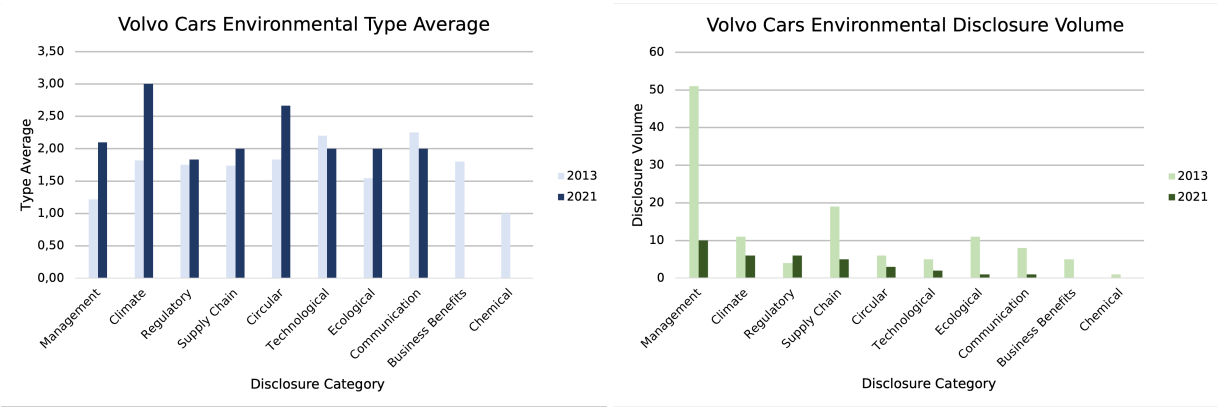

Figure 4.16: Volvo Cars Environmental Type Average & Disclosure Volume

The case of Volvo Cars is very similar to Volkswagens and GroupePSA's, at least if one ignores 2021. The by far most frequent category "environmental" was mentioned in for Volvo Cars in 2013 was also management, and beyond some mentioning in the context of the supply chain, management clearly stood out. However, in 2021 which is a example of integrated reporting, a lot changed for Volvo Cars. Whilst all categories dropped, management dropped the most by far, and on the same time, the type average increased by almost 1. Further, in regards to the type average, the same goes for most other categories where it has benn significant increases since Volvo Cars switch to integrated reporting. This indicates that whilst Volvo Cars reporting volume has decreased, the "quality" of those disclosures have actually increased. It should also be noted that similar to Volkswagen, the regulatory category stood out for Volvo Cars as the only category which increased over the time period.

4.3 How has sustainability reporting developed in the European automotive industry over the last decade?

In our research, we find that there has been a clear lack of cohesion in how the three different analyzed firms sustainability reporting has developed over the last decade. The most obvious example of that is Volvo Cars move towards integrated reporting, which drastically affected the types of sustainability keywords which was present in the report. However, even with the move towards integrated reporting, the overall disclosures volume still increased, which is on average true for all firms (with the exception of Volkswagen between 2016 and 2017). Hence, One of the key findings from our analysis is that the reporting frequency has increased over the past decade. This could be attributed to a growing awareness of the importance of sustainability and environmental responsibility within the automotive industry, as well as the rising expectations from stakeholders such as investors, regulators, and consumers which will be discussed in more detail in the next section.

Furthermore, we observed that the type of disclosure has also evolved, with a slightly increased focus on quantitative data and specific targets (i.e, a higher type of disclosure). This indicates a shift towards a more transparent and accountable approach to sustainability reporting. However, the development is slight, and whilst it stands out in some areas it lacks behind in others and there is no real cohesion as to where it stands out between the different firms.

In regard to the overall lack of cohesion, it can be exemplified by the varying disclosure frequencies and types across the three companies. For example, the keyword "Risk" sees a noticeable increase in disclosure frequency for Volkswagen from 2014 to 2021, with the most significant increase in the Risk Management category. In contrast, Volvo's disclosure frequency for the same category remains relatively stable in the same period, while Groupe PSA experiences a modest increase. This divergence in disclosure frequency suggests that the companies have differing priorities and approaches to sustainability reporting, which in turn affects the consistency and comparability of their reports.

Similarly, the analysis of the keyword "Development" also reveals substantial differences in disclosure frequencies across the companies. For instance, Volkswagen experiences a decrease in disclosure frequency for Technological and Operational categories between 2016 and 2021, whereas Volvo sees an increase in the same categories from 2013 to 2021. Meanwhile, Groupe PSA's disclosure frequency increases for Human Capital and Local Communities categories between 2012 and 2021. This suggests that the companies have different focal points in their sustainability reporting, further contributing to the lack of cohesion in the industry.

Moreover, the disclosure type average for various keywords, such as "Environmental" and "Emission," also shows significant disparities among the three companies. For example, the Volkswagen's disclosure type average for the Climate category decreases from 2.33 in 2014 to 1.70 in 2021, while Volvo's disclosure type average increases from 1.82 in 2013 to 3.00 in 2021 for the same category. This indicates that the companies are not only focusing on different aspects of sustainability but are also disclosing information in different ways, making it challenging to draw direct comparisons.

In conclusion, the answer to the question "How has sustainability reporting developed in the European automotive industry over the last decade?" is that it has been characterized by a lack of cohesion, as evidenced by the disparities in disclosure frequencies and types among the three analyzed companies. While there has been an overall increase in reporting frequency and a slightly greater focus on quantitative data and specific targets, the inconsistencies across companies hinder the comparability and effectiveness of sustainability reporting in the industry. This highlights the need for increased collaboration and standardization to ensure that sustainability reporting becomes a more cohesive and transparent tool for addressing environmental and social issues in the automotive industry.

4.4 What has been the main drivers for change regarding sustainability reporting?

4.4.1 Regulations

The first and most obvious driver for change that naturally comes to mind is regulations. The regulations by which the subjects of this study are affected, as discussed in the literature review, include the NFRD which came into effect in 2014 and the CSRD which will come into effect in 2023 (EuropeanComission, 2023). The NFRD, which is the only law that has been enforced under the analyzed time frame, requires companies, according to the Swedish governmental agency Finansinspektionen, to:

"The report should contain sustainability-related disclosures that are required to understand a firm's earnings, position, development, and the impact on its operations. The Directive specifies environmental protection, social responsibility and the treatment of employees, respect for human rights and the prevention of corruption and bribery." (Finansinspektionen, 2022).

Beyond potential interpretation of the mandate, all firms have gone above and beyond the phrasing *"disclosures that are required to understand a firm's earnings, position, development, and the impact on its operation"* and disclose both in terms of frequency and scope substantially more than what is mandated, which is in line with the conclusions of Stolowy and Paugam (2018) about information overload. Hence, it is not plausible that the NFRD has affected the change in sustainability reporting that our research has observed. Furthermore, the CSRD, which potentially could have had an effect on the later years in the analyzed time span as firms prepare for future legislations, has not significantly widened the scope of the NFRD and will not include anything that the firms are not already doing, with the exception of mandatory external auditing.

4.4.2 Legitimacy

Based on our results, it is possible to argue that legitimacy has been a driver of change in the sustainability reporting of automotive companies. The substantial increase in word count of "risk" and its focus on various risk management strategies is for example indicative of this by these companies addressing stakeholder concerns in order to maintain their legitimacy in regards to sustainability

Further, in regards to retaining legitimacy after scandals, the case of Volkswagen's "Dieselgate" scandal provides evidence of how legitimacy concerns can drive changes in NFRs ("Volkswagen emissions scandal", 2023). Although we do not have access to the 2015 report, the change in word counts from 80,000 in the 2016 report to 50,000 in the 2017 report could be seen as an attempt by Volkswagen to regain legitimacy by altering their NFR strategy in response to the scandal. As suggested by Bellucci et al. (2021), this substantial reduction in word count might reflect Volkswagen's efforts to focus on transparency and taking responsibility for the scandal by making structural changes and emphasizing the scandal rather than trying to avoid it.

Furthermore, the overall increase in word counts observed in our dataset may be driven by the need for automotive companies to demonstrate their commitment to sustainability and gain legitimacy in the eyes of their stakeholders. As sustainability has become a more prominent concern among consumers and investors, it is likely that companies have adapted their NFRs to meet these expectations and maintain a positive image.

In the context of the information overload observed in sustainability reports, one possible explanation for the additional information could be marketing-related content (Singleton-Green & Hodgkinson, 2013). As indicated in the literature, NFRs tend to focus more on shareholders than stakeholders (Lindgren et al., 2021), making them a suitable audience for marketing efforts.

Our research findings reveal significant changes in the word counts across various categories related to the marketing purpose for engaging in NFR. For instance, the word count for "Risk Management" increased from 47 to 114 for Volkswagen, and from 25 to 29 for Volvo. Similarly, the word count for "Environmental" increased from 23 to 101 for Groupe PSA. These increases suggest that the companies under study are utilizing the flexibility of sustainability reporting to convey a positive image of their sustainability efforts and achievements.

Furthermore, our results indicate a notable focus on the "Development" category, with prominent subcategories such as "Technological," "Operational," and "Human Capital." While not always directly related to sustainability, these topics may be emphasized for marketing purposes. For example, showcasing advancements in technology or emphasizing the importance of human capital can create a positive image of the company, which can differentiate it from competitors and potentially appeal to environmentally conscious consumers.

Hence, it is likely that the firms utilize the flexibility of the current regulations to use the space of sustainability reporting to market themselves towards the different readers of the reports and hence gain legitimacy.

Discussion

The central theme emerging from our research indicates that the development of sustainability reporting in the European automotive industry over the last decade has been characterized by significant disparities in both the frequency and type of disclosures. Despite a general trend towards increased reporting frequency and a slightly heightened focus on quantitative data and specific targets, the inconsistencies among companies undermine the comparability and effectiveness of sustainability reporting within the industry. This invokes a discussion on the forces driving these changes and the implications for further regulations and standardization within the sector.

5.1 Legitimacy as a Driving Force

The empirical evidence from our study strongly suggests legitimacy as a primary driver for developments in sustainability reporting. The findings are well aligned with the theories presented by Deegan (2002), who argue that organizations regularly seek to establish or retain legitimacy through exhaustive Non-Financial Reports (NFRs), which coupled with what Pohl (2021) stated, is especially relevant in the automotive industry as the industry is under scrutiny from stakeholders due to the industries high impact in the are of sustainability. Hence, by creating these disclosures, companies demonstrate their commitment to the stakeholders' values and expectations, thereby fostering their legitimacy.

A clear manifestation of the legitimacy-driven transformation in NFR practices can be observed in the aftermath of high-profile scandals. Volkswagen's "Dieselgate" scandal serves as an notable example. Volkswagen significantly decreased its report length following the scandal, suggesting that their sustainability report is something which is considered influential by Volkswagen in affecting their stakeholders. This resonates with the findings of Corazza et al. (2020), who suggested that a firms do commonly use their sustainability reports to "distract" the reader away from a scandal through a shift in focus or a "hiding in plain sight" strategy.

However, it is not merely during periods of turbulence that the drive for legitimacy influences reporting practices. Our study reveals a continuous increase in reporting frequency and a consistent focus on specific keywords, demonstrating the ongoing desire of companies to uphold their image and legitimacy among stakeholders. This trend aligns with the theories presented by S. Gray (1988), suggesting that firms utilize NFRs as a means to manage their social and environmental impacts, while simultaneously enhancing their image with stakeholders. As sustainability gather more attention from investors and consumers, companies are re-calibrating their reporting practices to mirror these expectations and safeguard their credibility.

Similarly, the modern trend of information overload observed in sustainability reports, as suggested by Stolowy and Paugam (2018), could be attributed to the drive for legitimacy. In an attempt to secure their legitimacy, companies may strategically incorporate marketing-related content into their reports. Given the latitude provided by current regulations, companies may exploit sustainability reporting as a platform for promoting their commitment to sustainability, thus projecting a favorable image. This hypothesis is supported by Gallego-Álvarez et al.

(2010), who advocate that non-financial information is an efficient domain for firms to market their products or services.

To sum up, the legitimacy-based motivations fundamentally influence the evolution of non-financial reporting practices. The increasing focus on sustainability among stakeholders and the public, combined with the strategic use of NFRs for marketing purposes, implies that legitimacy continues to act as a driving force behind the dynamics of non-financial reporting. This underscores the need for more research and regulation in the domain, ensuring that NFRs cater to their intended purpose and present the information genuinely relevant to stakeholders.

5.2 The Role of Regulations

While regulations, such as the NFRD and the forthcoming CSRD, are often considered as potential drivers for standardizing disclosure requirements, their impact on the sustainability reporting practices of the observed companies appears to be limited. Our findings resonate with Stolowy et al. (2018), who suggested that firms often exceed what is mandated, leading to an information overload.

The NFRD, which was implemented during the studied period, requires companies to disclose sustainability-related information necessary to comprehend a firm's financial position, earnings, development, and operational impacts. However, all of the analyzed firms have substantially exceeded these requirements in both the frequency and scope of their disclosures. This suggests that the NFRD has not been the key driver for the observed changes in their sustainability reporting.

The forthcoming CSRD, while potentially influencing firms' preparations for future legislations, does not seem to substantially widen the scope of the NFRD. The primary change introduced by the CSRD is a mandatory external auditing requirement, which is unlikely to significantly impact the existing reporting practices of the firms. It could be further speculated, in line with Bó (2006), the persuit for legitimacy which has been observed is in part a method for regulatory capture where firms have attempted to show that they do not need to be regulated.

However, it should also be noted that whilst regulations do not appear to effect the bulk nor the direction of the reporting, it could be a source for the need for firms to legitimize themselves. For example, it is hard to say if firms would have seen the same need to gain legitimacy in the field of sustainability if regulators did not enforce regulations to underline the importance of sustainability. Furthermore, in the midst of the phenomena of information overload, the regulations can still have effect in the form of technical details such as emission details which could have a big impact for stakeholders to be aware of but which do not take up much space in the reports.

All in all, the findings of Singleton-Green and Hodgkinson (2013) that the observed information overload in NFR is contradictory in the sense that a common complain is lack of relevant information in NFR, is in line with the findings of this study. Further, Singleton-Green and Hodgkinson (2013) conclusion that the current regulatory landscape is lackluster is also observed through the low effect regulatory changes has on the sustainability reports.

5.3 Implications and Future Research

The methodology used in this thesis, where the CONI-model was extended with a NLP-analysis to widen the initial scope of the method, has to the best of our knowledge never been done before. Hence, arguably a methodological contribution has been made which could be utilized by future researchers. Our methodology, and potential modifications of it, is best applied to research scenarios where it is required that both a big sample is applied but also a more thorough qualitative analysis, something that is often hard to combine. The type of data the methodology can be applied to extends beyond various firm reports and it could with little modification be applied to large sets of news articles, websites, or any other textual medium where the format and content are similar in between the samples.

Furthermore, the code developed in this thesis could be used for inspiration and/or direct use in similar research projects (Rafstedt & Lidvall, 2023). However, it should be noted that the code has not been developed with this in mind and that the repository is poorly documented and contains several blocks of unused and/or experimental code. Additionally, the ESG-keyword list as developed in this thesis could be put directly to use or used as a source of inspiration in research cases where a ESG related word list is of value.

In regard to the results of this thesis, it seems that further regulations may not substantially affect how firms report on sustainability, as they already disclose considerably more than what is mandated. While further regulations may introduce minor technical changes, they are unlikely to address the observed information overload. Therefore, future regulations might need to focus more on encouraging standardization and comparability in reporting, rather than simply increasing disclosure requirements.

Information overload has been shown in this study to be one of the major issues in the current state of NFR in the european automotive industry. It does not only damage the comparability between the different firms but it also draws attention from the most important disclosures. Hence, future research will need to study how information overload can be counteracted. For example, could regulations limit how much that is allowed to be disclosed in a sustainability report, such as only requiring firms to disclose their top twenty most impactful efforts in the different areas environmental protection, social responsibility, human rights, and corruption and bribery along with their quantitative disclosures?

The study also highlights the need for further research into the role of legitimacy as a driver for sustainability reporting. Understanding how firms use reporting as a tool for gaining legitimacy could provide insights for developing strategies and policies that encourage more effective and comparable sustainability reporting. Future studies could also examine the influence of marketing on reporting practices and its potential implications for the quality and comparability of sustainability reports.

However, legitimacy as a driver for change instead of regulations is not inherently bad. Legitimacy in relation to sustainability reports is often discussed in conjunction with greenwashing, such as by Seele and Gatti (2017). Whilst an un-sustainabile firm, in line with Seele and Gatti (2017), for sure can use their sustainability reporting to attempt to legitimize themselves as sustainable firms, truly sustainable firms will also use their sustainability reporting to legitimize themselves since if you do not tell anybody that you are sustainable in your practices,

people will most likely don't think that you are. Further, in line with the findings of Herbohn et al. (2014), Lodhia et al. (2022), and Bacha and Ajina (2019), firms that show strong sustainability performance tend to disclose more extensively in their sustainability reports. Hence, since the analyzed firms to various degrees shows increase in their reporting volumes, it may very well be that the legitimizing strategies the firms impose is a legitimate endeavor. However, even if the purpose of the firms reporting is not greenwashing, the observed development where legitimacy concerns is in the drivers seat still makes comparability difficult to achieve because of information overload. Hence, whilst the intent and purposes of the firms of using the sustainability reports to legitimize themselves may be good, regulations are still needed to reduce information overload and standardize the reporting.

Additionally, a subject meriting future research that has not been addressed in this thesis involves the influence of fashion on sustainability reporting within the automotive industry. That is, automotive firms frequently collaborate with the same auditors, consultants, etc. Given the notable degree of convergence already present in the automotive industry, one might anticipate a significant level of uniformity in their sustainability reports. However, this thesis has found the opposite to be true, suggesting an intriguing area for further investigation.

In conclusion, our findings underscore the necessity for regulators to guide the NFR field into a state of increased standardization and understandability. Currently, the field is riddled with information overload and different methods of presentation which makes relevant information both hard to find and close to impossible to compare between firms. Going forward, our research show that regulators will need to be more creative and/or mandating in how NFR should be performed to make the regulations achieve its desired goals.

Conclusion

The research conducted in this study has provided a detailed examination of the development of sustainability reporting in the European automotive industry over the past decade in accordance with the stated purpose where a spotlight was shined on the effects of regulations and legitimacy. The findings have uncovered considerable disparities in both the frequency and type of sustainability disclosures among companies, thereby raising concerns about the comparability and overall usefulness of these reports.

The first question we set out to answer, *How has sustainability reporting developed in the European automotive industry over the last decade?*, can be concluded with that over the past decade, sustainability reporting in the European automotive industry, as evidenced by three analyzed firms, has seen increased frequency and a modest shift towards quantitative data and specific targets. However, a distinct lack of cohesion across the companies hinders comparability and effectiveness. Volvo Cars' shift to integrated reporting led to changes in disclosure content, yet volume of disclosures increased across all firms. Companies' different focuses can be seen in the varied disclosure frequencies for keywords like "Risk" and "Development", and the type of disclosure for "Environmental" and "Emission".

The second question we set out to answer, *What has been the main drivers for change regarding sustainability reporting?*, can be concluded with legitimacy, driven by stakeholder demands and marketing, being the major driving force in regards to the development. Whilst regulations have a minor effect on technical details, it appears that firms disclose substantially more than what is mandated which leads to information overload.

Considering these findings, several crucial implications arise. The results suggest that simply implementing more regulations might not significantly alter the way firms approach sustainability reporting, as companies already disclose considerably beyond what is mandated. The real challenge lies not in increasing the disclosure requirements but in addressing the existing information overload and promoting standardization in reporting practices.

To address these issues, future research should explore strategies to mitigate information overload. One such approach could be the introduction of regulations that limit the volume of disclosures in sustainability reports, thereby emphasizing the most impactful sustainability efforts and quantitative disclosures.

Furthermore, the role of legitimacy as a driver for sustainability reporting merits deeper exploration. Unraveling how companies manipulate sustainability reporting as a tool for legitimacy can provide valuable insights that can be used to devise policies promoting more effective and comparable sustainability reporting. This also highlights the importance of scrutinizing the influence of marketing on sustainability reporting, given its potential to compromise the quality and comparability of reports.

This study has also made a methodological contribution in which it has been shown how the CONI-model can be expanded to include the use of NLP to be filter larger datasets for later qualitative studies.

In conclusion, this study has underscored the urgent need for increased standardization and collaboration within the European automotive industry to improve the efficacy of sustainability reporting. It is hoped that the insights gained from this study will prompt further exploration into this critical area and inform policy-making efforts to enhance the transparency, comparability, and overall impact of sustainability reporting in the automotive industry. This research, therefore, serves as a stepping stone towards a more sustainable and accountable automotive sector in Europe.

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Appendix

A.1 Appendix 1

esg_keywords = ['air', 'biodiversity', 'carbon', 'circularity', 'climate', 'compliance', 'community', 'diversity', 'emission', 'energy', 'ethic', 'governance', 'greenhouse', 'hazardous', 'human', 'inclusion', 'land', 'labor', 'pollution', 'recycling', 'renewable', 'risk', 'social', 'stakeholder', 'sustainability', 'supply', 'transparency', 'water', 'efficiency', 'health', 'safety', 'chain', 'management', 'alternative', 'autonomous', 'biofuel', 'catalyst', 'charge', 'clean', 'collaboration', 'conservation', 'consumption', 'demand', 'depletion', 'development', 'digital', 'disclosure', 'effluent', 'electrification', 'empathy', 'endangered', 'engagement', 'engineering', 'environmental', 'ethical', 'extinction', 'fleet', 'green', 'habitat', 'hybrid', 'impact', 'infrastructure', 'innovation', 'just', 'local', 'low', 'materiality', 'mobility', 'natural', 'nonrenewable', 'oil', 'particulate', 'planet', 'plastic', 'powertrain', 'provenance', 'quality', 'range', 'recyclable', 'regulation', 'renewable', 'resilience', 'responsibility', 'reuse', 'smart', 'stewardship', 'sustainable', 'technology', 'transportation', 'urban', 'waste', 'wellbeing', 'wildlife', 'emissionless', 'electric', 'bioenergy', 'biomaterial', 'upcycling', 'solar', 'ecodesign', 'offset', 'microplastic', 'e-waste', 'afforestation', 'reforestation', 'decarbonization', 'accident' 'bikeability', 'walkability', 'noise', 'bioeconomy', 'low-carbon', 'retrofit', 'cogeneration', 'degrowth', 'biodegradable', 'zero-waste', 'carpooling', 'ridesharing', 'emobility', 'xeriscaping', 'remanufacturing', 'regenerative', 'telecommuting', 'refurbishment', 'upgradable', 'public', 'adaptation', 'mitigation', 'volatility', 'traceability', 'reforestation', 'microgrid', 'co2-neutral', 'remediation', 'revitalization', 'multimodal', 'intermodal', 'interconnected', 'livability', 'reusability', 'repurposing', 'eco-efficiency', 'air-quality', 'carbon-neutral', 'cogeneration', 'greenbuilding', 'eco-city', 'renewable', 'bioplastic', 'biodegradation', 'bioremediation', 'permaculture', 'agroforestry', 'geothermal', 'wind', 'hydropower', 'carbon-sequestration', 'carbon-capturing', 'carsharing', 'scootersharing', 'bikesharing', 'eco-driving', 'composting', "capture"]

(Amount of words: 141)

A.2 Appendix 2

Promt given to ChatGPT:

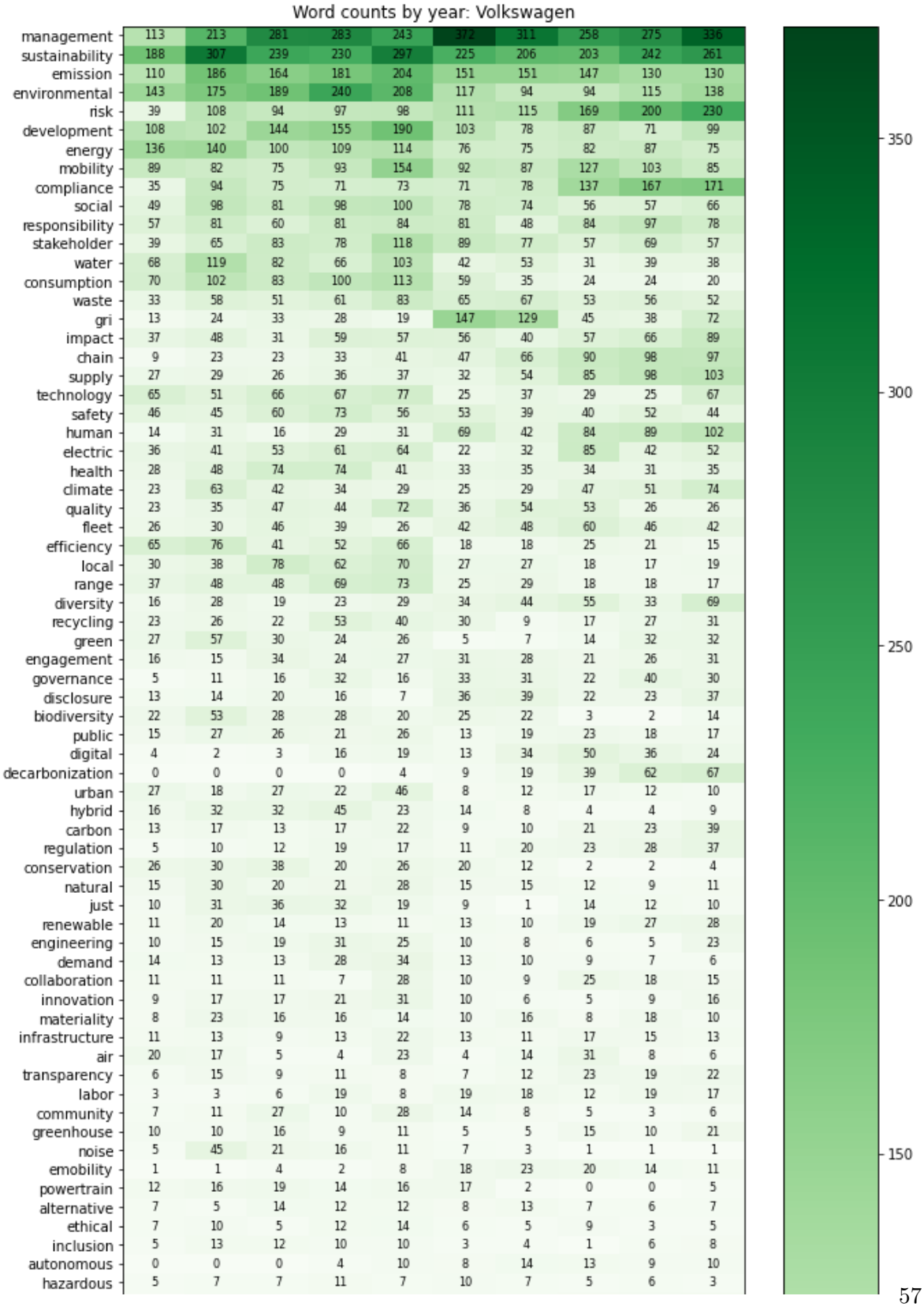
"Hello, we are developing a word list containing sustainability related words which will be used to filter out all non-sustainability related words in sustainability reports. The sustainability reports comes from european automotive firms. Below, we will provide you with our current list, please extend it with as many words as you can come up with, rather too many words than too few (preferably, we would like the final list to contain more than 100 words).

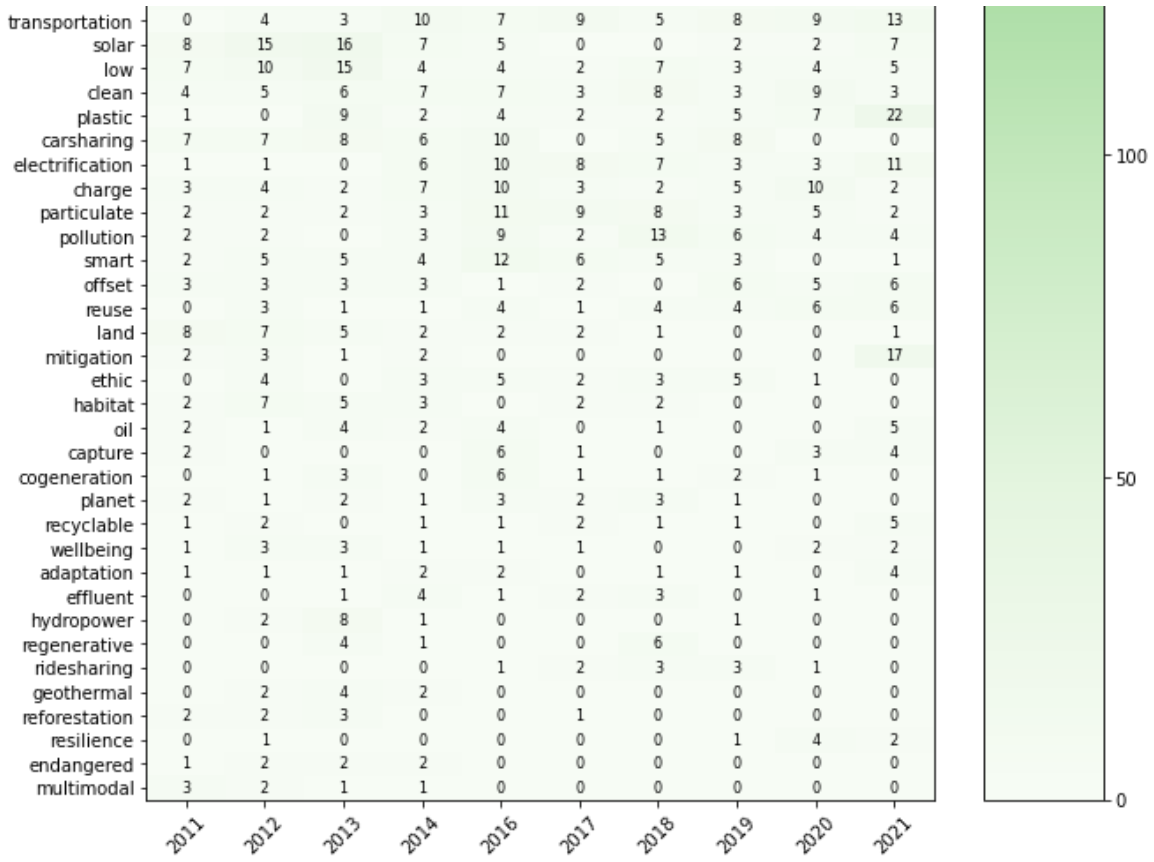
esg keywords = ["sustainability", "diversity", "solar", "wind", "hydro", "emission", "renewable", "energy", "efficiency", "electric", "hybrid", "pollution", "climate", "biofuel", "recycling", "circularity", "green", "biodiversity", "conservation", "carpooling", "ridesharing", "carbon-neutral", "decarbonization", "water", "air-quality", "waste", "social", "community", "ethical", "transparency", "stakeholder", "labor", "inclusion", "innovation"]"

Response: "Hello! I understand that you're looking for an extensive list of sustainability-related words to filter European automotive sustainability reports. I'm happy to help you expand your current list. Here's a selection of additional words and phrases that could be relevant to your project:

(Appendix 1) "

A.3 Appendix 3

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solar 8 15 16 7 5 0 0 2 2 7
low 7 10 15 4 4 2 7 3 4 5
clean 4 5 6 7 7 3 8 3 9 3
plastic 1 0 9 2 4 2 2 5 7 22
carsharing 7 7 8 6 10 0 5 8 0 0
electrification 1 1 0 6 10 8 7 3 3 11
charge 3 4 2 7 10 3 2 5 10 2
particulate 2 2 2 3 11 9 8 3 5 2
pollution 2 2 0 3 9 2 13 6 4 4
smart 2 5 5 4 12 6 5 3 0 1
offset 3 3 3 3 1 2 0 6 5 6
reuse 0 3 1 1 4 1 4 4 6 6
land 8 7 5 2 2 2 1 0 0 1
mitigation 2 3 1 2 0 0 0 0 0 17
ethic 0 4 0 3 5 2 3 5 1 0
habitat 2 7 5 3 0 2 2 0 0 0
oil 2 1 4 2 4 0 1 0 0 5
capture 2 0 0 0 6 1 0 0 3 4
cogeneration 0 1 3 0 6 1 1 2 1 0
planet 2 1 2 1 3 2 3 1 0 0
recyclable 1 2 0 1 1 2 1 1 0 5
wellbeing 1 3 3 1 1 1 0 0 2 2
adaptation 1 1 1 2 2 0 1 1 0 4
effluent 0 0 1 4 1 2 3 0 1 0
hydropower 0 2 8 1 0 0 0 1 0 0
regenerative 0 0 4 1 0 0 6 0 0 0
ridesharing 0 0 0 0 1 2 3 3 1 0
geothermal 0 2 4 2 0 0 0 0 0 0
reforestation 2 2 3 0 0 1 0 0 0 0
resilience 0 1 0 0 0 0 0 1 4 2
endangered 1 2 2 2 0 0 0 0 0 0
multimodal 3 2 1 1 0 0 0 0 0 0
2011
2012
2013
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2017
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2019
2020
2021
100
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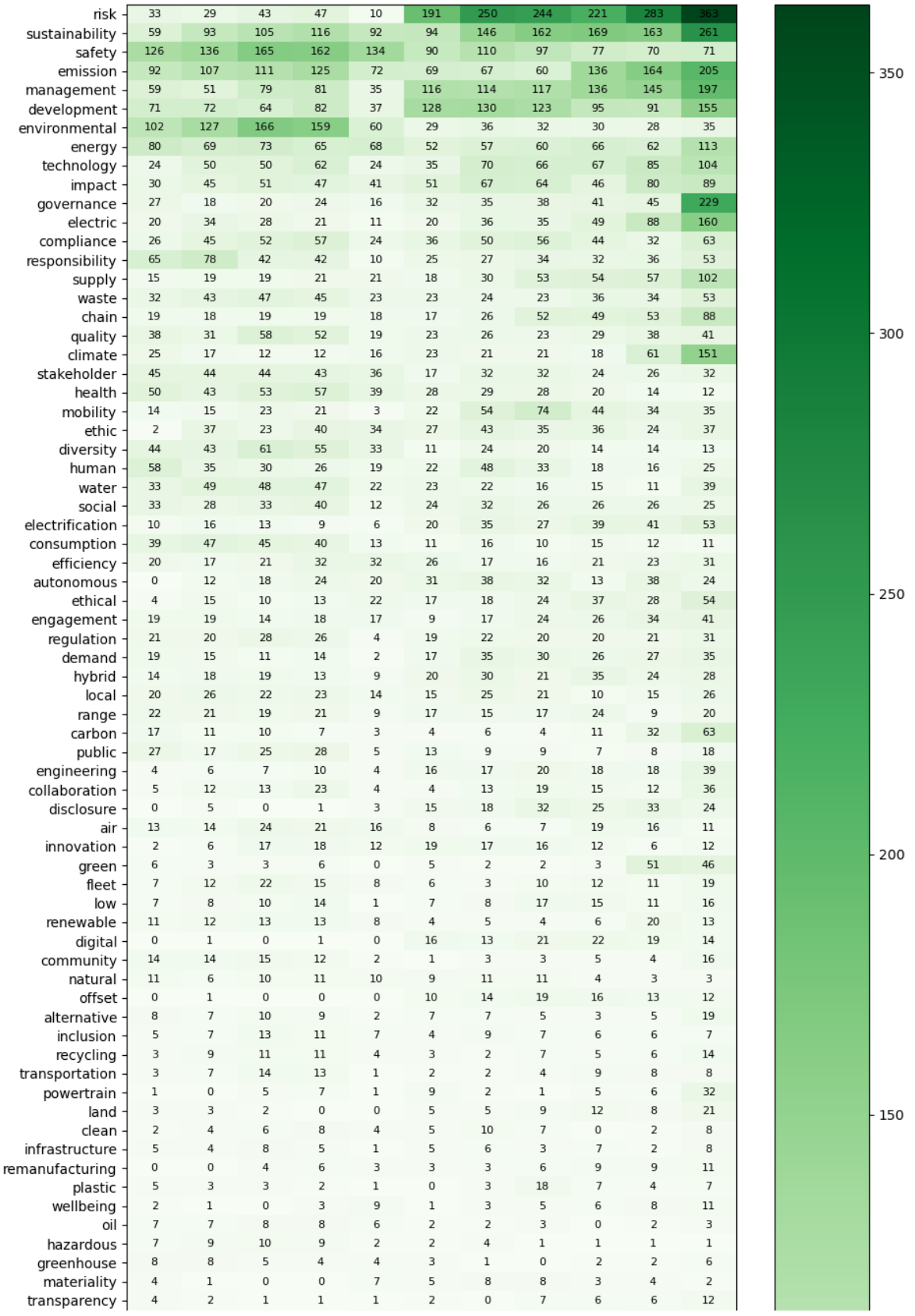
Word counts by year: Volvo Cars



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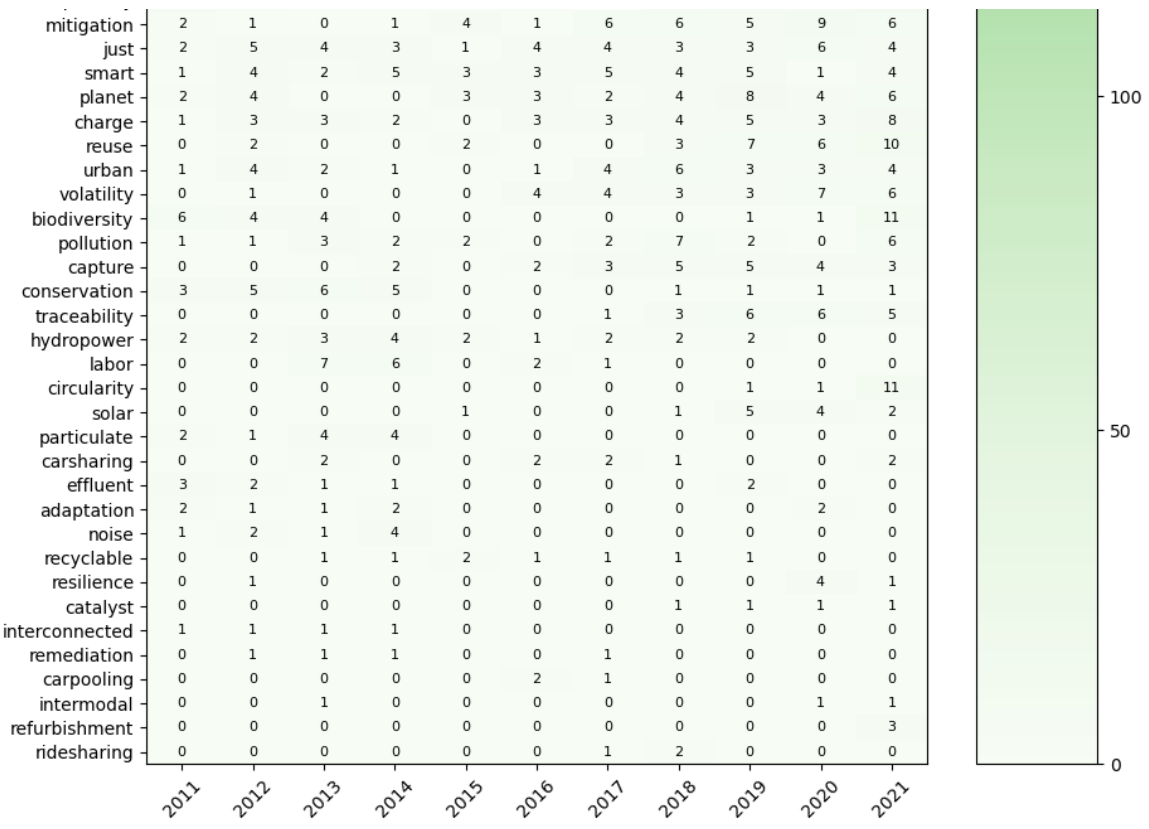
risk	33	29	43	47	10	191	250	244	221	283	363
sustainability	59	93	105	116	92	94	146	162	169	163	261
safety	126	136	165	162	134	90	110	97	77	70	71
emission	92	107	111	125	72	69	67	60	136	164	205
management	59	51	79	81	35	116	114	117	136	145	197
development	71	72	64	82	37	128	130	123	95	91	155
environmental	102	127	166	159	60	29	36	32	30	28	35
energy	80	69	73	65	68	52	57	60	66	62	113
technology	24	50	50	62	24	35	70	66	67	85	104
impact	30	45	51	47	41	51	67	64	46	80	89
governance	27	18	20	24	16	32	35	38	41	45	229
electric	20	34	28	21	11	20	36	35	49	88	160
compliance	26	45	52	57	24	36	50	56	44	32	63
responsibility	65	78	42	42	10	25	27	34	32	36	53
supply	15	19	19	21	21	18	30	53	54	57	102
waste	32	43	47	45	23	23	24	23	36	34	53
chain	19	18	19	19	18	17	26	52	49	53	88
quality	38	31	58	52	19	23	26	23	29	38	41
climate	25	17	12	12	16	23	21	21	18	61	151
stakeholder	45	44	44	43	36	17	32	32	24	26	32
health	50	43	53	57	39	28	29	28	20	14	12
mobility	14	15	23	21	3	22	54	74	44	34	35
ethic	2	37	23	40	34	27	43	35	36	24	37
diversity	44	43	61	55	33	11	24	20	14	14	13
human	58	35	30	26	19	22	48	33	18	16	25
water	33	49	48	47	22	23	22	16	15	11	39
social	33	28	33	40	12	24	32	26	26	26	25
electrification	10	16	13	9	6	20	35	27	39	41	53
consumption	39	47	45	40	13	11	16	10	15	12	11
efficiency	20	17	21	32	32	26	17	16	21	23	31
autonomous	0	12	18	24	20	31	38	32	13	38	24
ethical	4	15	10	13	22	17	18	24	37	28	54
engagement	19	19	14	18	17	9	17	24	26	34	41
regulation	21	20	28	26	4	19	22	20	20	21	31
demand	19	15	11	14	2	17	35	30	26	27	35
hybrid	14	18	19	13	9	20	30	21	35	24	28
local	20	26	22	23	14	15	25	21	10	15	26
range	22	21	19	21	9	17	15	17	24	9	20
carbon	17	11	10	7	3	4	6	4	11	32	63
public	27	17	25	28	5	13	9	9	7	8	18
engineering	4	6	7	10	4	16	17	20	18	18	39
collaboration	5	12	13	23	4	4	13	19	15	12	36
disclosure	0	5	0	1	3	15	18	32	25	33	24
air	13	14	24	21	16	8	6	7	19	16	11
innovation	2	6	17	18	12	19	17	16	12	6	12
green	6	3	3	6	0	5	2	2	3	51	46
fleet	7	12	22	15	8	6	3	10	12	11	19
low	7	8	10	14	1	7	8	17	15	11	16
renewable	11	12	13	13	8	4	5	4	6	20	13
digital	0	1	0	1	0	16	13	21	22	19	14
community	14	14	15	12	2	1	3	3	5	4	16
natural	11	6	10	11	10	9	11	11	4	3	3
offset	0	1	0	0	0	10	14	19	16	13	12
alternative	8	7	10	9	2	7	7	5	3	5	19
inclusion	5	7	13	11	7	4	9	7	6	6	7
recycling	3	9	11	11	4	3	2	7	5	6	14
transportation	3	7	14	13	1	2	2	4	9	8	8
powertrain	1	0	5	7	1	9	2	1	5	6	32
land	3	3	2	0	0	5	5	9	12	8	21
clean	2	4	6	8	4	5	10	7	0	2	8
infrastructure	5	4	8	5	1	5	6	3	7	2	8
remanufacturing	0	0	4	6	3	3	3	6	9	9	11
plastic	5	3	3	2	1	0	3	18	7	4	7
wellbeing	2	1	0	3	9	1	3	5	6	8	11
oil	7	7	8	8	6	2	2	3	0	2	3
hazardous	7	9	10	9	2	2	4	1	1	1	1
greenhouse	8	8	5	4	4	3	1	0	2	2	6
materiality	4	1	0	0	7	5	8	8	3	4	2
transparency	4	2	1	1	1	2	0	7	6	6	12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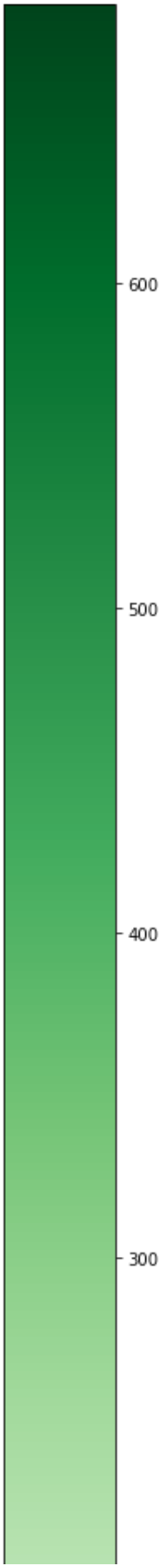
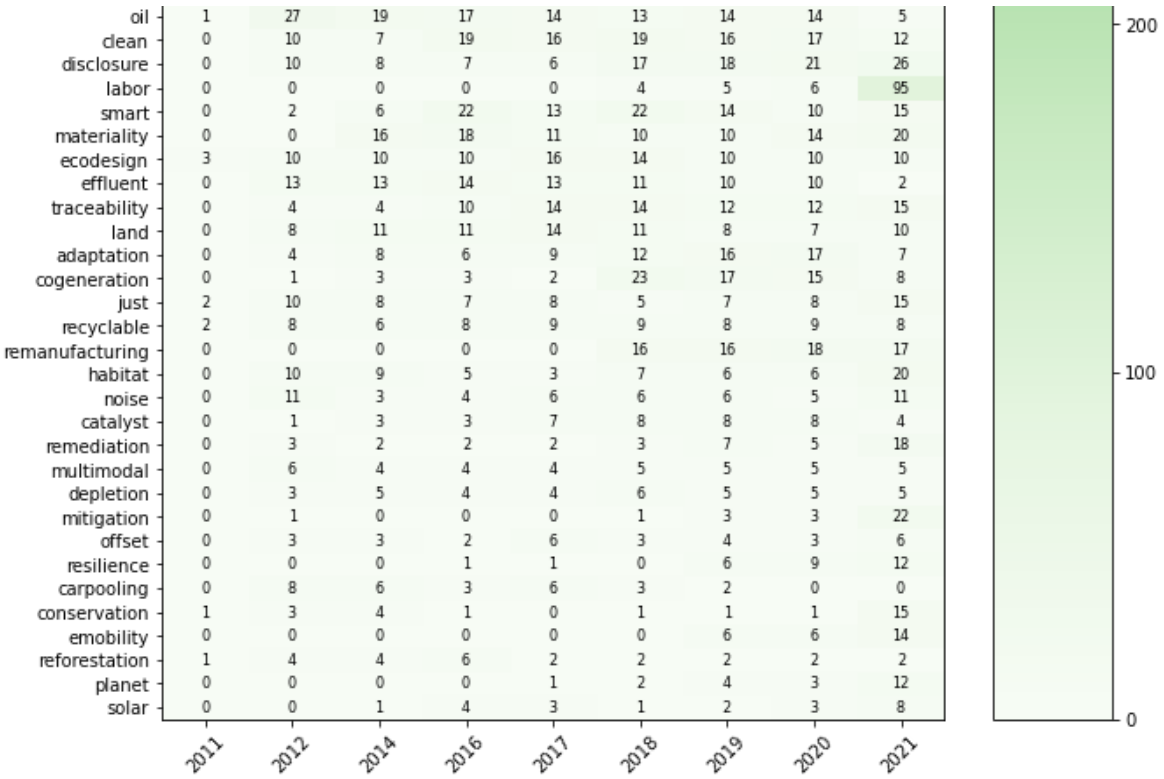
just 2 5 4 3 1 4 4 3 3 6 4
smart 1 4 2 5 3 3 5 4 5 1 4
planet 2 4 0 0 3 3 2 4 8 4 6
charge 1 3 3 2 0 3 3 4 5 3 8
reuse 0 2 0 0 2 0 0 3 7 6 10
urban 1 4 2 1 0 1 4 6 3 3 4
volatility 0 1 0 0 0 4 4 3 3 7 6
biodiversity 6 4 4 0 0 0 0 0 1 1 11
pollution 1 1 3 2 2 0 2 7 2 0 6
capture 0 0 0 2 0 2 3 5 5 4 3
conservation 3 5 6 5 0 0 0 1 1 1 1
traceability 0 0 0 0 0 0 1 3 6 6 5
hydropower 2 2 3 4 2 1 2 2 2 0 0
labor 0 0 7 6 0 2 1 0 0 0 0
circularity 0 0 0 0 0 0 0 0 1 1 11
solar 0 0 0 0 1 0 0 1 5 4 2
particulate 2 1 4 4 0 0 0 0 0 0 0
carsharing 0 0 2 0 0 2 2 1 0 0 2
effluent 3 2 1 1 0 0 0 0 2 0 0
adaptation 2 1 1 2 0 0 0 0 0 2 0
noise 1 2 1 4 0 0 0 0 0 0 0
recyclable 0 0 1 1 2 1 1 1 1 0 0
resilience 0 1 0 0 0 0 0 0 0 4 1
catalyst 0 0 0 0 0 0 0 1 1 1 1
interconnected 1 1 1 1 0 0 0 0 0 0 0
remediation 0 1 1 1 0 0 1 0 0 0 0
carpooling 0 0 0 0 0 2 1 0 0 0 0
intermodal 0 0 1 0 0 0 0 0 0 1 1
refurbishment 0 0 0 0 0 0 0 0 0 0 3
ridesharing 0 0 0 0 0 0 1 2 0 0 0
2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
100
50
0

Word counts by year: GroupePSA

	2010	2011	2012	2013	2014	2015	2016	2017	2018
emission	26	263	305	413	449	497	498	498	567
risk	4	183	266	348	360	395	479	503	686
management	26	239	310	399	379	433	428	443	473
environmental	21	247	320	459	435	438	367	364	311
mobility	32	203	270	430	395	411	367	346	356
development	84	212	236	319	332	327	369	386	447
safety	15	234	287	318	322	342	361	374	369
impact	6	148	236	305	322	345	347	357	418
social	12	171	294	283	260	274	270	282	266
quality	11	74	185	290	303	289	333	332	243
human	9	83	170	208	219	226	290	304	337
energy	6	123	157	214	233	241	249	257	319
sustainability	61	127	149	271	273	281	205	203	226
waste	3	117	180	267	265	275	236	231	221
local	7	157	190	234	214	205	219	223	214
health	3	144	184	181	179	189	211	239	248
technology	23	122	157	245	182	194	210	200	240
consumption	10	115	170	254	256	218	192	212	140
compliance	6	58	95	181	202	233	225	230	189
supply	8	29	85	141	161	171	176	194	365
chain	8	23	77	157	179	176	162	186	304
ethic	2	93	129	137	147	150	199	204	91
water	1	63	103	143	136	147	156	162	203
innovation	21	95	149	184	136	129	138	136	81
stakeholder	0	45	81	157	159	165	157	159	138
regulation	2	60	98	125	114	140	156	154	180
electric	18	63	47	121	148	150	155	150	146
governance	6	99	96	114	118	122	112	111	163
climate	0	35	23	36	43	62	224	230	271
responsibility	12	96	94	121	128	118	109	117	92
gri	0	18	22	21	13	90	91	91	482
public	2	55	71	110	109	132	128	123	91
carbon	15	102	76	90	84	82	76	88	186
air	1	41	74	104	110	109	113	115	100
natural	5	50	63	62	62	69	99	102	181
recycling	2	48	79	97	103	89	85	90	81
diversity	0	57	60	69	72	59	61	64	165
community	8	81	74	74	57	55	55	57	128
ethical	2	68	67	95	95	93	46	44	66
efficiency	4	53	48	73	69	78	74	82	90
range	21	48	46	68	75	75	70	76	78
hybrid	26	77	51	69	60	81	74	67	45
fleet	7	22	44	72	72	88	86	76	57
autonomous	1	2	8	72	71	75	70	71	72
transparency	0	11	30	70	69	74	59	57	52
particulate	0	38	44	62	65	62	53	54	32
digital	0	1	10	57	58	54	55	60	78
green	8	33	25	36	39	50	51	50	71
biodiversity	1	28	41	48	36	38	46	45	74
greenhouse	2	27	37	51	58	58	37	35	32
wellbeing	0	8	11	33	41	38	45	53	65
engineering	4	14	19	25	44	45	29	32	75
carsharing	0	8	14	65	56	45	45	34	9
charge	3	13	10	32	33	39	46	52	43
low	2	46	23	30	27	28	34	32	44
hazardous	0	18	24	41	36	35	27	29	36
renewable	3	13	15	42	42	30	25	32	39
urban	1	23	45	24	36	29	27	24	25
pollution	0	27	27	35	31	29	30	30	19
inclusion	0	6	17	13	19	28	28	26	88
collaboration	0	7	27	35	32	26	30	34	32
demand	9	25	11	18	27	26	29	28	48
powertrain	4	7	20	22	17	31	36	42	42
reuse	0	8	18	25	29	25	28	26	41
infrastructure	0	13	13	23	24	27	26	25	27
alternative	1	15	10	21	20	22	28	29	30
plastic	0	16	18	23	22	24	22	21	22
electrification	1	0	1	13	4	13	13	13	106
engagement	0	5	4	7	10	17	19	22	45
transportation	1	9	13	8	13	23	22	21	18




oil 1 27 19 17 14 13 14 14 5
clean 0 10 7 19 16 19 16 17 12
disclosure 0 10 8 7 6 17 18 21 26
labor 0 0 0 0 0 4 5 6 95
smart 0 2 6 22 13 22 14 10 15
materiality 0 0 16 18 11 10 10 14 20
ecodesign 3 10 10 10 16 14 10 10 10
effluent 0 13 13 14 13 11 10 10 2
traceability 0 4 4 10 14 14 12 12 15
land 0 8 11 11 14 11 8 7 10
adaptation 0 4 8 6 9 12 16 17 7
cogeneration 0 1 3 3 2 23 17 15 8
just 2 10 8 7 8 5 7 8 15
recyclable 2 8 6 8 9 9 8 9 8
remanufacturing 0 0 0 0 0 16 16 18 17
habitat 0 10 9 5 3 7 6 6 20
noise 0 11 3 4 6 6 6 5 11
catalyst 0 1 3 3 7 8 8 8 4
remediation 0 3 2 2 2 3 7 5 18
multimodal 0 6 4 4 4 5 5 5 5
depletion 0 3 5 4 4 6 5 5 5
mitigation 0 1 0 0 0 1 3 3 22
offset 0 3 3 2 6 3 4 3 6
resilience 0 0 0 1 1 0 6 9 12
carpooling 0 8 6 3 6 3 2 0 0
conservation 1 3 4 1 0 1 1 1 15
emobility 0 0 0 0 0 0 6 6 14
reforestation 1 4 4 6 2 2 2 2 2
planet 0 0 0 0 1 2 4 3 12
solar 0 0 1 4 3 1 2 3 8
2011
2012
2014
2016
2017
2018
2019
2020
2021
200
100
0

A.4 Appendix 4

List of references to reports included in study

- "Sustainability Report 2011" (Volkswagen, 2011)
- "Sustainability Report 2012" (Volkswagen, 2012)
- "Sustainability Report 2013" (Volkswagen, 2013)
- "Sustainability Report 2014" (Volkswagen, 2014)
- "Sustainability Report 2016" (Volkswagen, 2016)
- "Sustainability Report 2017" (Volkswagen, 2017)
- "Sustainability Report 2018" (Volkswagen, 2018)
- "Sustainability Report 2019" (Volkswagen, 2019)
- "Sustainability Report 2020" (Volkswagen, 2020)
- "Sustainability Report 2021" (Volkswagen, 2021)
- "Sustainable Development and Annual Report 2011" (GroupePSA, 2011)
- "Corporate Social Responsibility 2012" (GroupePSA, 2012)
- "2014 CSR Report" (GroupePSA, 2014)
- "Corporate Social Responsibility Report 2016" (GroupePSA, 2016)
- "Corporate Social Responsibility Report 2017" (GroupePSA, 2017)
- "Corporate Social Responsibility Report 2018" (GroupePSA, 2018)
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- "Corporate Social Responsibility Report 2020" (GroupePSA, 2020)
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- "GRI Report 2011" (VolvoCars, 2011)
- "Sustainability Report 2012" (VolvoCars, 2012)
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- "Volvo Car Group Annual Report 2016" (VolvoCars, 2016)
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- "Volvo Car Group Annual and Sustainability Report 2021" (VolvoCars, 2021)