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Textmining Analysis on Conceptualizing Embedded Topics in EU ESG Discussion

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| Abstract |

Environmental, Social and Governance (ESG) issues are gaining attention in politics, academic literature and business, yet the sudden soaring interest has brought certain ramification. Some issues are overlooked and lagging behind due to skewed focus on the causality and relationship with particular area such as financial performance. Under the assumption that there are underlying concepts beyond the issue of ESG evaluation score, the aim of this research is to explore and conceptualise the embedded ESG topics and policy implications from EU legislative documents. Considering limited research have been attempted to analyse ESG topics in EU documents and textmining algorithm to the field of ESG discussion provides further research topics, this research contributes to both practical and academic implications.

Using textmining methodology of wordcloud and LDA topic modeling

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analysis, this research analyses the 89 documents retrieved from EUR-Lex portal published during 2019-2021, containing ESG related keywords. The result shows that 10 main topics are discovered from the analysis, and EU ESG discourse can be categorised three pillars with one regulatory framework: 1) ESG and Trade and Social development, 2) ESG and Sustainable Investment and 3) ESG and Industry with 4) ESG regulations.

▪ Key words: ESG, Textmining Analysis, Topic modeling, EU Green Deal, Non-financial disclosure

Ⅰ. Introduction

Environmental, Social and Governance (ESG) issues are gaining attention in politics, academic literature and business. Multinational corporations in Korea have actively launched their own committees responding to global ESG regulatory frameworks. In December 2021, the Korean Ministry of Environment announced non-legally binding principles, called 'K-Taxonomy Guidelines', to support corporate understanding of 'Green Economy'. The private sector has collaborated with academia to generate better solutions for companies to be compliant without hampering their business portfolio.

ESG considerations have become mainstream. In the United Nations Climate Change Conference (COP 26), almost 200 countries agreed to the Glasgow Climate Pact, a global agreement that promotes action on climate change in line with the Paris Agreement. International Financial Reporting Standards (IFRS) Foundation Trustees announced at the COP 26 that they will create an ESG disclosure standard by the end of 2022.

However, the sudden soaring interest in ESG has certain ramifications. According to the Edleman report in 2021, investors believe that 82% of

companies globally frequently exaggerated their ESG achievements. Such a tendency is ironic considering one of the cores of ESG is “Governance” –the transparency of information disclosure. Private evaluation agencies put ESG on their website homepage, advertising their own indicators by which to judge firms. Corporations are confused about what to follow, without knowing critical issues discussed in the field. They are not prepared to clearly capture what ESG is and address the issues that have been discussed at regional and global levels.

In the political context, applying regulations tends to negatively impact countries’ development strategies, resulting in debate from opponents. Particular industries, such as nuclear energy and natural gas, are still under debate. Country-level discussions on whether the industries can be considered ‘green’ have been parallel. Some opponents are questioning the role of the green deal should concentrate on encouraging green transition, not imposing penalties to polluters (*Reuters* 2020/12/04).

It is not surprising that ESG is in the spotlight in academia or that various researches have been conducted from diverse perspectives. Due to its nature of broad concepts, less effort has been invested in providing a pathway to navigate ESG within whole concepts. Rather, research has been focused on the causal relationship between ESG score and financial indicators, where companies can easily adopt.

In order to address the gap, this research suggests text-mining analysis to capture the embedded keywords and topics discussed in EU ESG context. By using wordcloud analysis, which has been widely used to navigate political debates, business strategies, customer response, this research provides meaningful approach to understand the by analysing frequency of words within the EU documents. In addition, the Latent Dirichlet Allocation (LDA) topic modeling, an unsupervised machine learning techniques is introduced for exploring words and phrase patterns, conceptualising the ESG related topics within sample documents

(Blei et al. 2003). The purpose of this study is to find the embedded concepts by using textmining analysis with LDA topic analysis. This technique is used to address three key questions:

1) What are the embedded keywords in the EU ESG discussion?
2) How can ESG-related documents be categorised and what topic relations are observed among categories?
3) What are the on-going discussion agenda and policy implications in each category?

This paper contributes to both practical and academic implications. In practical perspective, as previous research attempted to identify the key message of CEO to shareholder (Bang 2018) and to capture the emerging topics regarding Brexit debate in Twitter (del Gobbo et al. 2021), this research contributes to analyse the emerging highlights on ESG-related legislative and policy documents. In theoretical perspective, this paper proposes two main implications. This paper contributes to strengthen the textmining methodologies that have been applied twitter, policy documents, presidential speeches and academic abstracts in order to capture emerging topics. Second, this paper is an exploratory research playing a role on providing embedded important topics within EU ESG discussion. This approach is possible to suggest guidance and pathways for researchers' in-depth analysis per topics.

This paper proceeds as follows: Section 2 reviews past academic literature regarding ESG, outlining the characteristics of ESG perspectives in academia, and textmining analysis. Section 3 introduces the methodology used to capture the current on-going discussion in EU ESG documents. Text mining analysis, the word cloud analysis and topic modelling, will be introduced. Section 4 presents the results of the study. Section 5 discusses the key takeaways by cross-referencing each result. Finally, Section 6 concludes by addressing limitations with recommendations for future study.

Ⅱ. Literature Review

1. Environmental, Social, and Governance (ESG)

Given the broadness of ESG, the research areas are diverse and no official definition exists. In academia, research on ESG has been focused on four topics. The first one investigates its relationship with corporate financial performance. Most empirical research examines the causal relationship between financial performance and ESG scores graded from evaluation firms. While Corporate Social Responsibility (CSR) strategies are often treated as 'outside business', ESG strategies are 'inside business' since ESG is a core tactic that brings direct financial impact. Discussion on the relationship between investment and ESG is not new, it has been examined since the late 1990's. Early research relationship was highly skewed towards 'Investment' rather than ESG, as the focus was 'responsible investment' in the era of Business Ethics. Eccles & Viviers (2011, 389) define responsible investment as "Investment practices that integrate a consideration of ESG issues with the primary purpose of delivering higher-risk-adjusted financial returns". Van Duuren et al. (2016) argues that many conventional fund managers have already considered corporate ESG integration and disclosure during their investment process.

The second view regards ESG as an expanded concept of CSR. Some authors assume that ESG and CSR are both sets of corporates philanthropic actions, while others put in different categories. Zampone et al. (2021) insists the connectivity between CSR and resource-based view (RBV) while mentioning ESG as one component of CSR information disclosure and examining the positive co-relationship between a brand value creation and Environment and Social disclosure. Homburg et al. (2013) concept divides CSR into two facets as 'business practice CSR'

and 'Philanthropic CSR' to figure out trust-customer loyalty nexus in B2B context. Zhou & Wang (2020) focus on the influence of the parent firm's reputation risk on its CSR activities. The authors utilise ESG indicators to evaluate CSR activities.

The third view is the influence of ESG on customers. Researchers investigated causal effects of ESG disclosure on corporate brand image, brand value, and purchasing intention. This view assumes that ESG plays a vital role in reducing psychological distance to customers. ESG performance is interpreted under recognized theoretical models in consumer behaviour: brand credibility, brand image and perceive quality (Koh et al. 2022), corporate attractiveness to potential employees (Liu & Nemoto 2021), and brand valuation from signalling theory (Lee et al. 2022).

Some studies suggest focusing on the risk of ESG controversial activities hampering business performance. Papers in this category assume that the negative impact from ignoring ESG actions on corporate value is significantly greater than the positive impact of ESG activities on corporate value. Cornell (2021) argues that the risk associated with ESG may affect corporates' expected return. Folqué et al. (2021) highlighted risk-hedging strategies to manage ESG risks to sustainable investment. Baker et al. (2021) examined an association between ESG government risk and IPO pricing, concluding that underpricing was observed in a stronger ESG risk management environment.

It is notable that ESG research in academia have been highly skewed in identifying the identity of ESG, causal relationship with business performance, or risk factors and influence. Considering ESG is also regarded as not only emerging trend in business setting but also negotiating tools among nations, this paper argues that ESG discussions beyond scores are embedded in strategic documents.

2. European Green Deal and ESG

The European Green Deal (EGD) is a long-term strategy for transforming to a low-carbon economy. Aligned with the Paris Agreement in 2015, the deal describes the roadmap of green transition of the EU economy.

The European Commission has led the ESG agenda by adopting regulations through the EU legislation system. ESG is classified as the sub-theme of EGD, one of the six commission priorities for 2019-2024.[1] Along with EGD, the final report on the EU sustainable finance strategy, a report that emphasises two cores of the financial system. One is to strengthen the financial system's long-term, inclusive development and the other is to integrate ESG issues into investment decisions. Obtaining higher attention from policymakers and integrating into EU legislative frameworks, ESG has created a conducive environment for financial investors to be attractive.[2]

In order to implement the EGD, several regulatory frameworks with disclosure requirements were introduced. The requirements are divided into three pillars: the EU taxonomy, Non-financial reporting directive (NFRD), and Sustainable Finance Disclosure Regulation (SFDR).

The EU taxonomy regulation describes a classification system for environmentally sustainable economic activities. The regulation is a general guideline for companies, investors, and policy makers to define which activities are environmentally sustainable. The NFRD is an EU legal framework that the disclosure of non-financial and diversity information to be more accountable and responsible for a sustainable economy (Fiandrino & Tonelli 2021). The SFDR is a regulation that

1) EC, https://ec.europa.eu/info/strategy/priorities-2019-2024_en. (accessed on Jan 7, 2022)

2) ECB, https://www.ecb.europa.eu/ecb/climate/html/index.en.html. (accessed on May 10, 2022)

aimed to unveil how financial market participants reduce the adverse impact on the environment and society.[3)]

These pillars become a main source of analysis in academic literature. Research provides a legal overview on Europe's policies by linking with past political agendas (Rogge & Ohnesorge 2021) and describes current regulations.[4)]

The regulations' future responsibility and influence on corporate behaviour by analysing current gaps in the real world are examined. Pacces (2021) insists that the EU mandatory disclosure regulation ultimately curbs the greenwashing and institutional investors will put more attention on beneficiaries environmental and social preferences.

Efforts to understand current discussion topics within the regulations have been observed. Fiandrino & Tonelli (2021) examined the NFRD to discover main underlying issues and possible amendments by using textmining analysis with topic modeling algorithms. De Lucia et al. (2020) applies machine learning and logistic regression models to examine the relationship between ESG and financial performance.

Another focus is the reaction of market investors to financial instruments. Jakubik & Uguz (2021) conducted empirical studies to uncover the influence of the European green bond on insurance companies' equity price, providing implications to market investors. Pham & Huynh (2020) investigated the interaction between bond performances and investor attention by analysing the Google search volume index and five green bond indices.

However, it is worth noting that limited research has been done to understand what concepts and discussion points are encapsulated in the

3) EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0390&from=BG. (accessed on Dec 10, 2022)

4) Hummel, K. and D. Jobst (2022), "The Current State and Future of Corporate Sustainability Reporting Regulations in the European Union", https://ssrn.com/abstract=3978478. (accessed on May 6, 2022)

EU legislative documents. Despite vast range of documents in EU system, few studies have applied textmining approaches yet. Recognising such gaps, this study is designed to provide pathways to capture the concept of ESG from big-data analysis.

3. Textmining Analysis

Textmining analysis has been widely used in various acdemic terretories, providing pathway to analyse unstructured data. Borrowing from computer science, the analysis has gained attention and is often used to capture and categorise relevant concepts currently discussed. This approach has been applied to review the historic trends of research (Amado et al. 2018), analyse thematic landscape (Liu et al. 2019) and get insight from big data (Amado et al. 2018). It is also widely used in social sciences and management, applying topic modeling (Blair et al. 2020).

In fact, it is notable fact that text mining analysis has been initially attempted with analysing paper-based text in 1990's "to discover new trends about the word itself" (Hearst 1999 in Guerreiro 2016) and has been developed to computer-based processing with a number of big-data analysis algorithms including general natural language processing (NLP) of texts, wordcloud, topic modeling, and so on.

Wordcloud anlaysis is one of the textmining methodologies, analysing unstructured data. The strength of the analysis is an intuitive, visual representation of texts by displaying different font size of text based on the frequency of use so that the wordcloud is used mainly for keyword analysis. For example, the analysis is used to examine trend in public health sector for 65 years (Atenstaedt 2021) and in sustainability reports (Kulevicz et al. 2020). However, as McNaught & Lam (2010) pointed out, a word cloud stand-alone analysis is not recommended. Other researchers used the tool for supplementary method in initially grasping idea such as

Brexit topics (del Gobbo et al. 2021) and announcements of central bank (Benchimol et al. 2022). This research is using the tool to do preliminary study for grasping the difference of idea between two groups.

The topic modeling (TP) is the recently-developed methodology on textual analysis. The TP is an unsupervised machine learning techniques to detect particular words and phrase patterns, discovering the latent structure from a large set of collected text corpora (Blair et al. 2020). It has been applied in a wide range of fields such as finding out all topics from collected articles, catching the changes of research trend in a particular subject, analysing social media text (del Gobbo et al. 2021), examining online travel reviews and opinions, high ranked topics in biomedical research (Srinivasan 2004), marketing purpose and so on.

Latent Dirichlet Allocation (LDA) technique, one of the algorithms that executes topic modelling analysis is "a flexible generative probabilistic model for collection of discrete data" (Blei et al. 2003, 1014). This technique assumes that there (k) topics across the sample documents and each topics comprise a mixture of tokens (Blei et al. 2003). The technique is useful for processing large volumes of documents and provides reliable classification of topics without researchers' pre-designated keywords or categories (Goloshchapova et al. 2019).

This does not mean that the textmining is comprehensive or exhaustive. The limitations of textmining analysis should be taken into consideration. The analysis does capture the meaning of a term itself, but overlooks semantic information from the sentence. Like other methodologies, this tool also innate possibilities of researcher bias. It is likely that the subjectivity of the researchers intervenes the objectivity of analysis during the data collection, processing, and analysis process.

Recognizing such drawbacks, this research fully utilises the strength and benefit of the tool. This analytic tool offers a relatively objective assessment matrix when evaluating extensive data sets, minimising

potential bias from the researchers' perspectives. In addition, the techniques such as machine learning algorithms, have already developed and tested to overcome the related implicit researchers' bias as well as the pre-defined topics and categories (Fiandrino & Tonelli 2021).

Ⅲ. Methodology

The study applies a big-data analysis with two purposes. First, the textmining approach, one of the most widely-used approaches in big-data analysis, which provides a snapshot of the latest updates on particular discourses by crawling keywords from documents. Second, the topic modelling analysis offers basic directions of discussions from the massive amounts of corpus in key documents.

1. Data Collection and sample selection

The data is collected from the EUR-Lex (https://eur-lex.europa.eu/), an official website that contains the official EU legal documents and EU public documents. The platform provides the main stage of legal procedures and relevant preparatory documents that are generated during the legislation process. The documents were divided into 2 subgroups: legally binding documents and non-binding documents (see <Table 1>).

<Table 1> Legal status on Act

Classification	Legally binding	Legally non-binding
Type of Act	Regulation / Directive Decision / Guideline	Recommendation/ Opinion Preparatory documents

The sample was collected from official documents to the contribution on

the ESG from the website during 2019 – 2022. In order to retrieve the ESG-related documents, the 13 keywords[5] are applied. The 13 keywords are selected to capture 1) ESG consideration in high-level policy framework in legal, financial and regulative perspectivese, 2) discussions based on the characteristics of ESG, and 3) a word ESG itself. In EU context, the ESG has been discussed as a sub-category under the "Sustainable Finance" in "European Green Deal", a policy package that European Commission announced in its seven strategic priorities in 2019-2024. 'European Green Law', 'European Green Bond', 'Sustainable investment plan', 'fit for 55', and 'Taxonomy' were introduced as a backbone of its legal, financial and regulatory purpose. In addition, the aim of this research consideres key charicteristics of ESG reporting as non-financial disclosure, social and governance, and sustainability disclosure. The main search setting is 'Keyword in title' while expanding to 'Keyword in title AND text' when searching 'ESG'. The reason for this separate searching approach is that the ESG has never been indicated in the title. This approach helps to extract all documents containing ESG elements.

Among 95 documents retrieved from the 13 keywords, 89 documents are filtered as samples. Duplicate results from keywords and non-English documents were removed. In addition, documents containing images or tables only were ruled out.

<Table 2> indicates the number of legal-status documents. In total 22 binding documents and 67 non-binding documents are filtered. Considering the EU published sustainability-related disclosures for benchmarks in December 2019, the ESG-relevant documents are published increasingly in 2020 and 2021.

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5) 'Corporate Sustainability', 'Sustainable Finance', 'ESG', 'Sustainable Investment Plan', 'Taxonomy', 'European climate law', 'European green bond', 'European Green Deal', 'Fit for 55', 'Governance', 'Non-financial', 'Sustainability proofing', 'sustainability-related disclosure'

<Table 2> number of documents by classification and year

Legal Status	2019	2020	2021	Total	Note
Binding	6	7	9	22	Regulation, Directive, Decisions, Legislative Acts
Non-binding	5	33	29	67	Opinion, communication, resolution, impact assessment
Total	11	40	38	89	

2. Data Cleaning and preprocessing

In order to analyse unstructured data, we followed the standard steps of textmining analysis. First, the selected samples were downloaded as HTML source. If the samples were not provided with an HTML source, we downloaded MS word documents to do further analysis. While crawling the samples, numbers and punctuation were removed. Second, stopwords processing was applied to exclude commonly used words. In addition to the basic Python setting of 127 stopwords (e.g. 'a', 'my', 'new'), the legal terms used in documentation (e.g. 'article', 'accordance', 'paragraph'), and the terms such as 'EU', 'member', 'institution' were removed. Third, the lemmatisation process is followed to recognize various types of words as one term, such as plural to singular for nouns. Then, we transformed the words into lower cases and tokenized the lemmatized sample. Short (less than 4 symbols) and long (more than 20 symbols) tokens were removed.

3. Data Analysing: Word cloud and Topic modeling

The document-term matrix was applied to analyse the frequency of the terms in the sample. Although the 'bag-of-word' analysis is limited to analyse semantic context, the word cloud helps to interpret the prevalent

words and accounts for the underlying information from the dataset. The word cloud analysis recognises each expression as a single unit of analysis rather than reflecting the textual context of multiple sets of words (Atenstaedt 2021). For example, “Climate” and “Change” should be considered in one textual concept as “Climate Change”, and “risk” and “risks” should be analysed in one textual concept. Therefore, the meanings of words, terms or phrases may be lost during the analysis process. This research creates visualised outputs to show a set of most common words based on their frequency in respective documents. The data is divided in two groups as stated in section 3.1 to determine the difference of the term frequencies between the groups.

Meanwhile, It is critical to set the number of topics (k). The number of topics can affect the interpretation of the result (Landauer et al. 2013). In order to find the optimal number of ‘k’, this research applies the topic coherence and perplexity test of the corpus. Both tests are widely used tools to check the accuracy of the model (Blei et al. 2003). The perplexity test measures the performance of a trained language model while topic coherence analysis estimates the semantic similarity. Although the test result is also affected researcher’s viewpoint when selecting optimised ‘k’ for analysis, it is worth categorising ‘k’ concepts within ESG discourses by using salient terms in each category. Then the keywords are presented with the description of embedded concepts in the sample.

Ⅳ. Result

1. Data Visualization – Wordcloud

<Figure 1> and <Figure 2> illustrates the most frequent words used in the corpus of the sample documents. The font size corresponds to the

frequency of the terms. The figures indicate the result of word cloud analysis under respective categories. From the corpus from legally binding documents indicates that 'standards', 'risk', 'sustainability' are the most frequently used terms. Meanwhile, in non-legally binding documents, 'climate' along with 'change', 'companies', 'criteria', 'insurance' are observed.

<Figure 1> Word Cloud - Legally binding

<Figure 2> Word Cloud - Non-binding

<Table 3> The 10 most frequent words in sample (by legal status)

All samples		Legally binding		Non-binding	
climate	4,519	risk	1,196	climate	4,008
companies	3,809	sustainability	657	companies	3,508
risk	3,237	standards	606	insurers	2,670
market	2,933	assets	591	insurance	2,573
insurance	2,698	market	571	market	2,362
insurers	2,670	climate	511	framework	2,102
framework	2,332	credit	498	change	2,068
change	2,320	state	454	risk	2,041
state	2,256	measures	450	costs	1,938
criteria	2,100	value	449	criteria	1,911

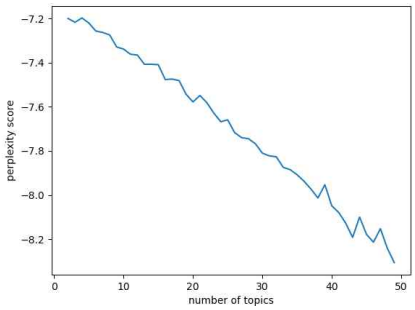
<Table 3> illustrates the most frequently used terms in respective categories. Given that the sample size of each group is different, as indicated in <Table 2>, the absolute number of frequencies is far bigger in the non-binding group than the binding group. The result implies that

1) some terms such as ‘insurance’, and ‘solvency’ appeared in the non-binding group while ‘reporting’ and ‘standard’ mainly appeared in the binding group, 2) ‘risk’ is observed in both groups with high frequencies, and 3) environment-related terms such as ‘climate change’, ‘energy’, ‘emissions’ are more used than social, governance related terms.

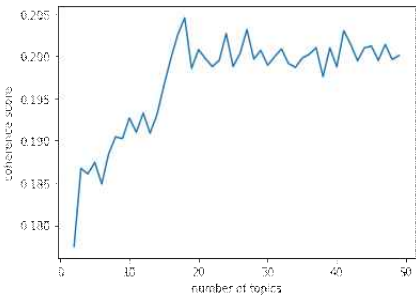
2. Topic modeling Analysis

Using a validity test through Python 3.0, the most reliable number of topics is concluded as eighteen (18) according to the figure 3 and 4. In order to select the number of topics, the random number of topics, 50 (K=50 topics), is used to analyse both tests. After the perplexity test (-7.5), and coherence test (0.2045), a number of topics were selected for a contents analysis.

<Figure 3> Perplexity Test



<Figure 4> Coherence Test

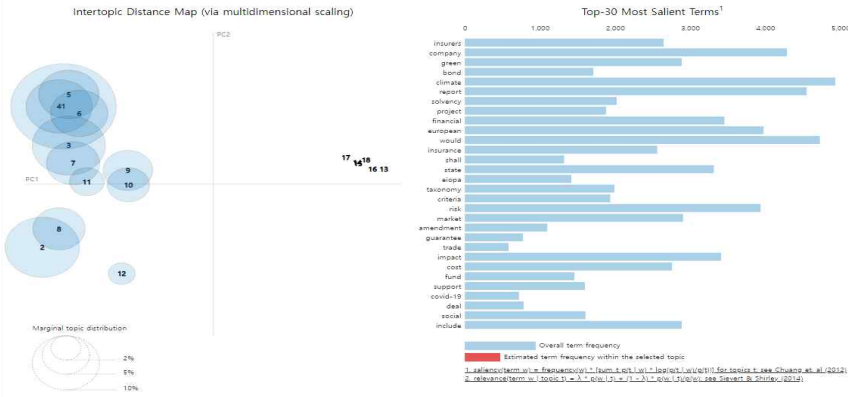


Based on the result of eighteen (18) topics, we set up the parameter as eighteen (18) for processing LDA topic modelling. The pyLDAvis library of Python used for topic analysis, a library that is a web-based interactive tool using LDA.

The LDA model from the previous task is then visualised using gensim and pyLDAvis library. More specifically, PyLDAvis is a Python

library for interactive topic model visualisation which helps users interpret the topics in a topic model.

<Figure 5> pyLDAvis result



The library provides two visualisation panels as shown in <Figure 5>. On the left side of the figure, the Inter-topic distance map illustrates the relationship between topics. The distance between each topic circle presents the relationship, which means topic number one (1) and four (4) are more similar than topic one (1) and seventeen (17). We can speculate five to six topic groups through this map. In addition, the size of the circle indicates the frequency and dominance of the topic. However, this does not mean that the topic with the biggest circle is the most important. As pointed in the limitation of textmining analysis, high-frequency terms are not equivalent to highly-informative ones. On the right-hand side, the library displays the top-30 most salient terms of each topic with a bar chart. The chart supports interactive mode so that the prevalence of words over entire term frequency appears when we click a particular topic in the map.

Among 18 topics, this paper selected 10 topics with highest weighted keywords for further explanation (see <table 4> below)

<Table 4> The 10 topics with highest weighted keywords

#	Topic	Keywords
1	European Green Bond	0.044*“bond” + 0.044*“green” + 0.016*“market” + 0.014*“taxonomy” + 0.012*“issuers” + 0.012*“would” + 0.010*“external” + 0.009*“report” + 0.009*“cost” + 0.009*“project”
3	Trade policy	0.037*“trade” + 0.018*“deal” + 0.016*“green” + 0.014*“must” + 0.013*“eesc” + 0.012*“policy” + 0.011*“food” + 0.009*“european” + 0.008*“farm” + 0.007*“standards”
4	IFRS and NFRD	0.040*“company” + 0.034*“report” + 0.022*“financial” + 0.012*“public” + 0.009*“ifrs” + 0.009*“state” + 0.009*“framework” + 0.008*“market” + 0.008*“list” + 0.007*“cost”
5	European green deal investment plan	0.025*“european” + 0.017*“green” + 0.016*“social” + 0.015*“eesc” + 0.013*“support” + 0.010*“need” + 0.010*“also” + 0.009*“plan” + 0.009*“climate” + 0.009*“deal”
10	Taxonomy	0.030*“report” + 0.029*“company” + 0.018*“financial” + 0.012*“would” + 0.012*“standards” + 0.011*“cost” + 0.010*“impact” + 0.010*“risk” + 0.009*“taxonomy” + 0.009*“include”
11	InvestEU	0.025*“guarantee” + 0.017*“fund” + 0.017*“shall” + 0.016*“financial” + 0.014*“investeu” + 0.014*“implement” + 0.014*“finance” + 0.014*“support” + 0.014*“european” + 0.012*“partner”
13	Taxonomy and nuclear energy	0.023*“criteria” + 0.017*“taxonomy” + 0.016*“climate” + 0.011*“change” + 0.010*“activity” + 0.008*“energy” + 0.008*“include” + 0.007*“economic” + 0.007*“impact” + 0.007*“european”
15	Socially fair transition: Fit for 55 package	0.038*“climate” + 0.019*“european” + 0.018*“state” + 0.017*“amendment” + 0.017*“shall” + 0.013*“objective” + 0.013*“measure” + 0.012*“emissions” + 0.012*“proposal” + 0.011*“change”
16	Climate proofing of infrastructure	0.040*“project” + 0.029*“climate” + 0.018*“impact” + 0.014*“risk” + 0.012*“change” + 0.011*“proof” + 0.010*“include” + 0.010*“social” + 0.010*“implement” + 0.008*“partner”
17	EIOPA and Solvency II in Insurance sector	0.026*“would” + 0.023*“insurers” + 0.019*“risk” + 0.019*“insurance” + 0.017*“solvency” + 0.012*“eiopa” + 0.011*“cost” + 0.010*“capital” + 0.009*“framework” + 0.009*“impact”

Ⅴ. Discussion and Policy implications

Based on the result of topic modelling, we categorised the topics as three pillars with one regulatory framework: 1) ESG and Trade and Social development, 2) ESG and Sustainable Investment and 3) ESG and industry with 4) ESG regulations (see <table 5> below). Topics are intertwined in each pillar as the topics imply various aspects across the documents. This section provides policy implications and key concepts within each category. Each category introduces key documents and strategies and contains current discussion points that can be considered for the future studies.

<Table 5> Categories in topics

Categories	Relevant topics
Trade and social development	European Green Bond (Topic 1) Trade Policy (Topic 3)
Sustainable Investment	European Green Bond (Topic 1), European green deal investment plan (Topic 5), InvestEU (Topic 11)
Industry	Trade Policy (Topic 3), Taxonomy and Nuclear energy (Topic 13), EIOPA and Solvency II in Insurance sector (Topic 15), Climate proofing of infrastructure (Topic 16)
Regulations	IFRS and NFRD (Topic 4), Taxonomy (Topic 10) Taxonomy and Nuclear energy (Topic 13)

1. ESG with Trade and Social Development

The EU regards trade as one of the significant driving forces for sustainable economic growth. The European Commission launched a new trade strategy in February 2021, which is strongly supported by the European Economic and Social Committee (EESC) as a way of improving market access. This highlights the EU's commitment to put the keywords 'green' and 'sustainable' into their core trade regime, while considering

social development aspects.

The keywords permeate into the industries and are interpreted within each strategy. EESC proposed the trade strategy aligned with the Green Deal Farm-to-Folks (F2F), a strategy that the European green deal set up to make a sustainable food system to achieve global levels of sustainability, and biodiversity strategies to conserve as well as restore nature. Since food systems consume a large volume of natural resources and accounts for approximately 33% of greenhouse gas emissions, the EU proposes to redesign the food system with a sustainable food value chain, bringing new opportunities in the field.

The EU also provides a legislative system to support its 'fair transition'. In the agriculture sector, Green Deal F2F offers the Farm Advisory System (FAS), a safety net that supports capacity building and technical assistance through the entire value chain. Following the 'no one left behind' principle from SDGs, the EU has formulated a mechanism that guides players to find a pathway to transit to a green economy while minimising their social and financial risk.

Moreover, the EU announced the transformational systemic change through the Fit for 55 packages, which set "ambitious targets for reducing net emissions by at least 55% by 2030 compared to 1990 and for being the first climate neutral continent by 2050".[6] In addition to the target of climate neutrality, the underlying principle of this topic also highlights the change that reduces systematic inequality. However, it further mentions that addressing such inequality is "not just a matter of fairness and solidarity, it is a wider societal necessity to tackle inequities that existed before the European Green Deal", and that the package can provide the safety net for those who are negatively affected.

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6) EC, https://ec.europa.eu/commission/presscorner/detail/en/IP_21_3541. (accessed on Jan 7, 2022)

This action is also interpreted as a tool to enhance competitive advantage of players within the region and construct non-tariff barriers to trade for competitors outside the region. Such ambivalence is inevitable in the international trade nexus, but it also strengthens the importance of the embedded agenda. For example, the EU announced its plan to pursue a global level of alliances on sustainable food systems with all partners. As EESC also mentioned their concerns of Non-EU competitors' intention not to adopt and implement such standards due to higher standard and costs, they are also aware of the disadvantage hampering the competitiveness in EU competitors. Such a movement to green alliance plays a role in leading higher standard political change, as well as market pressure in international nexus.

The case of Korea - EU FTA trade dispute illustrates how sustainable environmental policies, combined with global agenda, affect counterpart in political and diplomatic area. The dispute arose from EU's concern that South Korea did not act towards the adjustment of labour law and practice, complying trade and sustainable development obligations stated in the FTA agreement. Although the dispute has been settled through the resettlement mechanism, it is undeniable that the EU's initiatives on sustainable development including labour rights, environmental protection can play a significant role in bilateral discussion on trade policy as well as in gaining bargaining power.

2. ESG with Sustainable Investment

During and after COVID-19, the EU has discussed and launched several financing instruments, such as InvestEU, social climate fund, EGD investment plan. Although each instrument has its own concrete target, they adhere to common philosophic foundations.

First, the EU regards investment itself as a powerful tool to nudge the

players to engage the EU's aspirational transformation strategy of sustainable economy. European Climate Bond is aligned with the Taxonomy regulation, a regulation that provides legislative foundation to pursue a transition to a climate-neutral and resource efficient economy.

The Invest EU focuses on sustainability with three dimensions: climate, environmental and social. The fund supports key priority windows: sustainable infrastructure, research, innovation, and digitization; social investment; and markets that bring added value to the EU. Each window applies a customised regulation. For instance, under the Sustainable infrastructure dimension, the project must allocate 60% of investments for contributing climate and environmental objectives.

The European Green Deal Investment Plan was adopted in June 2020 to mobilise the EU funding and promote the transition to climate-neutral, green, and inclusive economy. The Investment Plan also known as Sustainable Europe Investment Plan (SEIP) is regarded as a key driver to achieve Sustainable Development Goals (SDGs) and the objectives of European Green Deal. EESC supports the review of NFRD, while pointing out the same standard application in both the public and private sectors. In addition, the plan emphasises the "implementation of standardised environmental and social clauses in public procurement".[7)]

Second, the instruments play a significant role in protecting vulnerable groups adversely affected from the transition. The New Social Climate Fund is especially designed to support European citizens who are at the most risk of mobility and energy poverty. The EU speculates 34 million people will be affected under energy poverty, so the Fund will support 72.2 billion euro during 2025-2032. Financing will be from the new emission trading system. The EU indicates the financing will be covered from 25% of the new system combined and 50% of national contributions

7) EC, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020AE0463. (accessed on Apr 21, 2022)

the commission will propose an amendment of the financial framework in order to secure the fund.

Aligning with SDGs, SEIP is based on the 'leave no one behind" principle. The SEIP plans to create an enabling framework to engage public and private investment for achieving a climate-neutral, green, and inclusive economy. The plan offers the Just Transition Mechanism (JTM) designed to support transition 'in a fair way'. The fund aims to mobilise 100 billion euro from 2021-2027 to minimise the socio-economic impact from the transition. Due to its social characteristic, the JTM supports workers to enhance their skill set, earning competitiveness in the job market as well as SMEs and startups to create new economic ecosystems.

3. ESG with Industry

European legislative documents account for not only the overall level of frameworks and regulations, but also industry or sector-wide approaches. The segmented guidelines assist the industries' participants to take prompt action towards a green society. Apart from the agriculture industry stated above, many industries are directly affected by the EU regulations, and it will inevitably expand to other industries. Institutions and the private sector published the documents to grasp the industry-specified trends promptly.

The financial sector is the most affected by the regulations. Since 2021, the EU taxonomy regulation has become mandatory to financial market participants providing and distributing financial products in the EU. In this category, participants from outside the EU are also under the same application.

The European Insurance Occupational Pensions Authority (EIOPA) said ESG risks are increasing in the European insurance and pension sector

and highlighted that sustainability issues should be integrated into Solvency II, so that insurance and pension sectors consider climate risk. The EIOPA's activities emphasise "Integrating ESG risks in the prudential framework of insurers and pension funds", 'Consolidating the macro/micro prudential risk assessment of ESG risks" and "Supporting supervision of ESG risks and supervisory convergence in the EU".

According to the commission staff working impact assessment report[8] insurers have limited incentive to support long-term financing of the economy. The report encourages insurers to contribute more to a green, sustainable economy. Recognising the climate and environmental risk that affects the insurance sector, EIOPA placed emphasis on ESG-related disclosure and the review of the NFRD, which was recently introduced in Solvency II.

There is debate whether nuclear energy and natural gas are considered "green". The main point raised is the negotiation of the Taxonomy Regulation. Opponents insist that nuclear waste violates 'do no significant harm' as well as being unsustainable, where supporters argue that nuclear energy has nearly zero emissions, contributing to climate change mitigation. To resolve this controversy, the European Commission conducted a "technical assessment of nuclear energy with respect to the 'do no significant harm' criteria of Regulation" to verify the industry itself fits the green taxonomy. Based on the report, the European Commission decided to include nuclear power and natural gas in green investment with tight conditions. However, opponents such as Germany, voted against the decision, reigniting the discussion.

In the infrastructure sector, the concept of "climate proofing" was introduced. The concept shed light on the importance of both climate change mitigation and adaptation. The private sector tends to put more

8) EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021SC0260. (accessed on Dec 10, 2022)

weight on mitigation rather than adaptation, as mitigation is directly relevant to non-financial information such as ESG score, affecting the reputation of the business. However, according to the COMMISSION NOTICE – Technical guidance on the climate proofing of infrastructure in the period 2021-2027, the document defines climate proofing as "a process that integrates climate change mitigation and adaptation measures into the development of infrastructure projects". This guideline helps European institutions and the private sector identify if the projects are aligned with the Paris Agreement so that climate proofing principles are embedded in the infrastructure sector, an industry that is often regarded as carbon emitting and less conserving. According to the World Bank, approximately 80% of carbon emission is coming from building and operating infrastructure.

Climate proofing is divided into two categories: 'climate neutrality' under mitigation and climate resilience under adaptation. Considering the fundamental principles of the European green deal is "no one left behind", it is necessary to assess not only the function of infrastructure that reinforce climate resiliency, but also the potential risk to vulnerable societies.

4. ESG with Regulations

From the literature review, the EU taxonomy, NFRD, and the SFDR are key regulatory frameworks within the ESG context in the EU. Those regulations are critical because they are the yardstick that assist EU's decision-making, fund mobilisation, and investment for the transition.

In order to secure the transparency of bond progress, the reporting requirement indicated in the Taxonomy regulations such as substantial contribution to environmental objectives should be followed. All the processes should be checked from the external reviewers on their compliance with the taxonomy alignment and regulations.

IFRS Foundation Trustees announced the establishment of the International Sustainability Standards Board and creation of ESG disclosure standard. The commission staff working document impact assessment regarding corporate sustainability reporting[9] highlighted the effectiveness of establishing standards for reporting non-financial information by indicating that fewer problems arise in financial reporting that follow internationally-agreed standards. To avoid companies getting pressure from different frameworks and standards, IFRS foundation creates the board to tackle climate reporting in the beginning. In addition, the document suggests that the Commission should endorse the international non-financial reporting standards through either way of accepting existing standard such as Global Reporting Initiative (GRI) or creating a new reporting standards as an expansion of IFRS's climate reporting effort.

According to the proposal for regulation of the European parliament and council on European green bonds, the standard provides main principles that should be followed within the framework. For example, the projects funded from the bond should entirely be aligned with Taxonomy Regulation. The Taxonomy provides the legislative foundation to the proposal for the European Green Bond, which pursues a transition to a climate-neutral and resource efficient economy. In order to secure the transparency of bond progress, the reporting requirement indicated in the Taxonomy regulations such as substantial contribution to environmental objectives should be followed. All the processes should be checked from the external reviewers on their compliance with the taxonomy alignment and regulations.

9) EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021SC0150. (accessed on Dec 10, 2022)

Ⅵ. Limitation and Conclusion

This research specifically investigates the ESG-related discussion in Europe. Considering the soaring global interest in ESG and the arising consequences resulting from such interest, we analyse the official legislative documents archived in the EUR-LEX system. We applied the word cloud and topic modelling tools, two of the most frequently used textmining analysis tools in academia, in order to capture the keywords and agenda currently discussed in the ESG agenda.

The results show 10 meaningful topics out of 18. They were then regrouped to investigate into three (3) main pillars as 1) trade and social development, 2) investment and 3) industry, and (1) one regulatory framework. The result clearly strengthens the hypothesis that critical embedded discussion points exist beyond ESG score. This is meaningful in both academic and practical ways, as the results capture not only agreed agenda but also on-going agenda that currently discuss their justification.

Apart from the methodological flaws mentioned in section 3, the limitation of this research is threefold. First, the methodology cannot fully eliminate the researcher's bias on the keyword selection. To retrieve the data from the EUR-Lex site, certain keywords should be listed from the researcher as there is no document that contains "ESG" in the subject. In order to minimise such bias, this research follows the Fiandrino & Tonelli (2021)'s pre-processing methodology on retrieving NFRD annex documents in EU system. In addition, by including keywords in European Green Deal strategies such as "corporate sustainability", "fit for 55", and "European green bond" to capture even small leads linking to ESG.

Second, the variation of the sample document's length might also be influential to the analysis process. Unlike analysing twitter threads (del Gobbo et al. 2021), tourist reviews (Kirilenko et al. 2021) and abstracts of

academic journals (Hung 2012) that have a limit on the number of words or characters to write, the EU legislative documents do not have a limit so there is a possibility of emphasising longer documents. In this sense, word cloud analysis considers such imbalance of the frequency so that the result can only be used for preliminary analysis, and we divide the sample into simply legal binding and non-binding to find the difference of frequency order. However, in order to overcome the limitation, this research is to extract sailents terms by setting certain range of words in the pre-processing stage as widely agree typical algorithm applied in many researches (del Gobbo et al. 2021; Fiandrino & Tonelli 2021; Atenstaedt 2021).

Third, as the EUR-lex platform uploads new documents frequently, this research should be continuously follow-up for capturing new topics. Likewise other topic and trend analysis research (Liu et al. 2019), this research makes a contribution in guiding topics for the future research. The result of this study can be the backbone of ESG discussion and further documents can be integrated into the sample, generating new branches and sub-themes.

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| 국문초록 |

텍스트마이닝을 이용한 EU ESG 법제화 연관문서의 논의점 분석

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본 연구는 최근 사회 전 영역에서 화두인 ESG의 논의점을 분석하여, 개념화하는 탐색적 연구이다. 기업활동의 평가 또는 재무적 성과와의 인과관계 분석을 주류로 하는 기존 ESG 연구이외에도 많은 논의점의 방향성이 있을 것이라는 가정을 토대로 본 연구는 EU 법제화 연관문서 내 1) ESG 관련, 현재 어떤 논의들이 진행 중인지, 2) 논의에 내재된 주요 개념은 어떻게 범주화 할 수 있는지, 3) 각 범주별 논의점과 정책적 시사점은 무엇인지, 라는 질문을 다룬다. 연구를 위해 텍스트마이닝 기법인 워드클라우드와 토픽모델링을 활용하였다. 따라서 본 연구는 EU의 공식문서의 비정형데이터 분석을 통한 ESG 주요 주제발굴에 대한 연구가 제한적이었다는 측면과 타 학제에서 활용되어왔던 텍스트마이닝 기법을 ESG 연관문서 분석으로 확장할 수 있다는 점에서 학술적, 실무적으로 기여할 수 있다.

분석을 위해 2019년부터 2021년까지 EUR-Lex 포털에 등재된 89개의 ESG 연관 법제화 문서를 추출하여 법적 구속력 유무에 따라 문서의 범주를 구분하여 각각 워드클라우드 분석을 실시, 핵심단어 출현 빈도의 차이를 비교하였다. 이후 Latent Dirichlet Allocation(LDA) 토픽모델링 분석을 통해 주요 주제 범주화를 실시한 결과 18개의 토픽 중 유의미한 10개의 토픽을 추출할 수 있었다. 그 결과 EU 법제화 문서는 크게 세 가지 범주(무역과 사회개발, 지속가능한 투자, 산업) 및 규제(NFRD, SFRD, 택소노미)의 측면에서 주요 논의가 되고 있음을 확인하였다.

▪ 주제어: ESG, 유럽그린딜, 텍스트마이닝 분석, 토픽모델링, 비재무정보공시