MSc Industrial Engineering & Management (IEM)

Evaluating the Impact of Integration of ESG Factors in Credit Ratings Using External Credit Assessment Institutions for Corporates

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Jens Reil
Enschede, February, 2025

Abstract

This thesis examines the integration of Environmental, Social, and Governance (ESG) factors into credit ratings, focusing on the methodologies employed by External Credit Assessment Institutions (ECAIs) and their implications for financial risk models, particularly in the banking sector. As ESG considerations gain increasing importance in investment decisions, understanding how these factors are incorporated into credit ratings has become critical for financial institutions like ING. This study investigates the varying approaches to ESG integration across different ECAIs and evaluates the challenges and opportunities posed by their respective methodologies. By conducting a literature review and assessing current practices, the thesis identifies ESG risks through ECAI methodologies and the important variables driving ESG risks to be considered within models. The research concludes by proposing actionable heuristics for financial institutions to better align their credit risk models with ESG factors, aiming to enhance transparency, regulatory compliance, and risk management strategies. The findings contribute to ESG integration in credit risk assessments, providing actionable insights for financial institutions like ING to adapt to evolving market expectations and regulatory demands.

Keywords: Credit Risk, Environmental, Social, and Governance (ESG), External Credit Rating Institutions (ECAIs), Credit Rating Agencies (CRAs), ESG Integration, Risk Management

Contents

Chapter 1

Introduction

1.1 Company Overview

ING Group[1] was established as the Internationale Nederlanden Groep ("International Netherlands Group") in 1991, following the removal of restrictions on mergers between insurers and banks. The group was formed through the merger of the insurance company Nationale-Nederlanden and the banking company NMB Postbank Groep (created in 1986 from the merger of NMB Bank and Postbank) [1].

Now, ING is a leading European bank with assets exceeding €1 trillion[2], with over 60,000 employees serving more than 38 million customers, businesses, and financial institutions across more than 40 countries [3]. ING offers a broad range of financial products, including savings, payments, investments, loans, and mortgages in retail markets. For wholesale banking clients, ING provides specialized lending, corporate finance, debt and equity market solutions, sustainable finance options, as well as payments and cash management, trade, and treasury services [3]. The goal of ING is to deliver value by making banking seamless, removing barriers, and empowering customers to make confident, informed decisions. Sustainability is a key component of ING's strategy, actively facilitating and financing society's transition to a low-carbon future while pioneering innovative finance solutions for a better world [3].

ING's shares[3] are listed on the stock exchanges of Amsterdam (INGA NA, INGA.AS), Brussels, and New York (ADRs: ING US, ING.N). ING is a market leader in the Netherlands, Belgium, and Luxembourg.

1.2 Problem Identification

The increasing importance of Environmental, Social, and Governance (ESG) factors in financial decision-making has prompted a need for transparency in how external credit rating institutions (ECAIs)[4] incorporate these factors into their methodologies [4]. The lack of heterogenity among CRAs poses challenges for institutions like ING, which rely on credit ratings to assess risk and make informed investment decisions. How ECAIs assess ESG risk and integrate ESG data in their methodologies will have a significant and

[1] https://www.ing.com/

[2] Taken from the ING second quarter results published on June 30, 2024 [2]. Find the 2Q2024 results here.

[3] For stock market data (NYSE - Nasdaq Real Time Price), follow NYSE: ING.

[4] ECAIs refer to credit rating agencies (CRAs) that issue and/or endorse credit assessments about entities and debt instruments in the form of credit ratings [4].

increasing impact on the monetary policy operations of the ECB [5].

Understanding where and how ESG factors are integrated into the methodologies of ECAIs is crucial for anticipating changes in credit ratings and adapting strategies accordingly. However, significant divergence persists among Credit Rating Agencies (CRAs) in terms of transparency and methodology[5]. While the European Securities and Markets Authority (ESMA) notes improvements in disclosures following its guidelines[6], inconsistencies in the treatment of ESG factors remain [7]. This lack of alignment creates challenges for financial institutions aiming to integrate ESG considerations effectively into their credit risk frameworks, potentially influencing broader financial mechanisms, such as the European Central Bank's (ECB's) monetary policy operations [5].

Understanding how ESG variables influence credit ratings could significantly impact risk management strategies and sustainable finance initiatives[7].

This thesis focuses specifically on integrating ESG factors into credit risk models with an emphasis on Probability of Default (PD) models, as outlined in the ECB guide to internal models[8]. By analyzing the methodologies of ECAIs, this research seeks to uncover patterns and inconsistencies, providing actionable insights for banks like ING to align their credit risk models with evolving ESG standards. The financial industry is seeking innovation in aligning credit risk assessments with ESG requirements, and a deeper understanding of ESG integration in ECAI methodologies could support banks in refining PD models to account for these critical factors.

1.3 Motivation

The increasing demand for sustainable investment and the integration of ESG principles in risk management underscore the need for financial institutions to gain deeper insights into how ESG factors are embedded in credit ratings. For banks such as ING, regulatory pressures and market expectations are driving the incorporation of ESG considerations into credit risk assessments [5]. ESG criteria provide banks and companies with valuable opportunities to strengthen their business relationships and differentiate themselves from competitors [10].

External Credit Assessment Institutions (ECAIs) play a pivotal role in the regulatory framework for credit risk under CRR3 guidelines. Under CRR3, there is a dual approach to calculating capital requirements: the Standardized Approach (SA), which directly incorporates external ratings provided by ECAIs, and the Internal Ratings-Based (IRB) approach. The SA is particularly relevant as it links the absence of external ratings to higher capital requirements by applying a higher risk weight (100% if not available), whereas the presence of external ratings results in lower capital requirements. Consequently, ECAIs are critical

[5]The level of disclosure regarding the definition and evaluation of climate change risk often lacks sufficient granularity to clearly identify an agency's assessment of specific climate change sub-factors. For most ECAIs and asset classes, current disclosures are insufficient for users to draw definitive conclusions about the materiality of individual climate change risk sub-categories, such as transition risk and physical risk [6].

[6]For more information about the finalization of the guidelines by ESMA, follow this link.

[7]Sustainable finance refers to the process of taking environmental, social and governance (ESG) considerations into account when making investment decisions in the financial sector, leading to more long-term investments in sustainable economic activities and projects [8]. For more information about sustainable finance, follow this link.

[8]The ECB guide to internal models provides detailed guidance on how banks should develop and validate their internal models, including those for PD estimations [9]. For more information, see the ECB guide to internal models.

for the output floor under CRR3, making their integration of ESG factors a key area of interest for financial institutions.

In addition, market expectations suggest that the availability of external ratings will increase over time. External ratings also form the basis for model calibration in scenarios where the number of defaults is low, such as for financial institutions. For models with higher numbers of defaults, such as those for large corporations, external ratings can serve as challengers to internally developed models. Where external ratings are utilized for modeling purposes, banks are required to compare the internal ratio criteria of ECAIs with their own methodologies, further emphasizing the importance of understanding ESG integration in external ratings.

By aligning PD models with the methodologies of ECAIs, banks can integrate ESG considerations into their risk assessments in a manner consistent with CRA approaches. Understanding where and how ESG factors are embedded in ECAI methodologies is crucial for anticipating changes in credit ratings and adapting strategies accordingly. Although the European Securities and Markets Authority (ESMA) notes that overall disclosures by ECAIs have improved since the introduction of its guidelines[9], significant divergence persists across Credit Rating Agencies (CRAs), leaving considerable room for further refinement [7].

This research aligns with ING's sustainable finance objectives[10] by developing a set of heuristics that supports decision-making around the integration of ESG factors into financial risk models. These heuristics aim to bridge the gap between the methodologies of ECAIs and internal bank models, facilitating the incorporation of ESG considerations in line with both regulatory expectations and market demands.

1.4 Research Questions

This thesis focuses on examining how ESG factors are integrated into credit risk assessments by ECAIs. It addresses the limitations of traditional methodologies and explores approaches to enhance transparency, consistency, and interpretability of ESG disclosures. The objective is to develop a set of heuristics that financial institutions, such as ING, can use to align credit risk models with ESG integration. The main research question for this thesis is:

"How do ESMA-registered External Credit Assessment Institutions (ECAIs) integrate ESG factors into their credit rating methodologies?"

To comprehensively address the main research question, this thesis explores several subquestions that focus on specific aspects of ESG integration in ECAI methodologies:

1. *How are ESG factors currently defined and categorized within the credit rating methodologies of ECAIs?*
   The integration of ESG factors into credit rating methodologies often lacks transparency and standardization across ECAIs, with varying definitions and categorizations [6]. These inconsistencies create challenges in understanding and comparing methodologies among agencies.

[9] For more information about the finalization of the guidelines by ESMA, follow this link.

[10] For more information about ING's views on climate, follow this link to see ING's key takeaways from their Climate Progress Update 2024.

2. *What specific ESG sub-factors are most commonly integrated into credit risk assessments?*
   While ESG factors are increasingly considered, limited clarity exists about which sub-factors are prioritized by ECAIs. This lack of detail complicates stakeholders' ability to assess the comprehensiveness of these methodologies [5].
3. *What are the implications of ESG integration on the comparability and consistency of credit ratings among ECAIs?*
   Differences in how ECAIs integrate ESG factors reduce the comparability and consistency of credit ratings. This lack of standardization complicates decision-making for financial institutions and highlights the need for harmonized practices [5].
4. *How can a set of heuristics be developed to guide financial institutions in integrating ESG considerations into their credit risk models?*
   This subquestion focuses on combining findings from the analysis of ECAI methodologies to propose actionable heuristics for aligning ESG considerations with credit risk frameworks, particularly for financial (banking) institutions like ING.

By addressing these subquestions, this thesis contributes to the understanding of ESG integration in credit assessments by ECAIs and develops a set of heuristics to guide ING in integrating ESG considerations into IRB models.

1.5 Thesis Structure

This thesis is structured into several chapters. *Chapter 1*, provides an overview of the research topic, identifying the problem at hand, outlining the motivation for the study, and presenting the primary research questions. It also introduces the research methodology used throughout the paper. The second chapter, Chapter 2, shows the theoretical framework that is used within the research. It also explains the process of paper selection and the structured literature review (SLR) approach used to collect and analyze the relevant literature. Chapter 3 offers the necessary background on the fundamentals of credit risk, the role of Credit Rating Agencies (CRAs), and the integration of Environmental, Social, and Governance (ESG) factors into credit ratings. This chapter highlights both the regulatory framework and the methodologies currently employed in the field. The results and discussion of the findings are discussed in Chapter 4, which presents the findings related to the integration of ESG factors in credit rating methodologies. It includes an evaluation of various CRAs and their respective methodologies for incorporating ESG factors into their assessments, looking into various variables like industry considerations, identified costs, materiality, and time horizons. Then, Chapter 5 moves toward the practical application of the research by offering recommendations for integrating ESG factors into Internal Ratings-Based (IRB) models. This chapter also includes scenario analysis to demonstrate the potential impact of these recommendations. The final chapter, Chapter 6, summarizes the key findings of the thesis, discusses the limitations of the study, and suggests directions for future research in this area. The appendix provides supplementary materials, including a selection of the papers reviewed, an overview of the registered and certified External Credit Assessment Institutions (ECAIs), and a detailed explanation of the methodologies used by the different CRAs selected.

Chapter 2

Methodology

2.1 Theoretical Framework

This thesis builds on a systematic review of both scientific literature (peer-reviewed journal articles and conference proceedings) and gray literature (reports, white papers, regulatory documents, and other non-peer-reviewed sources). The systematic literature review framework is based on PRISMA [11]. A thorough search is conducted in the Scopus[1] database and Google Scholar[2] for the review, which will be handled more in Section 2.2.1. The systematic literature review aims to explore the existing body of knowledge surrounding the integration of ESG factors within credit ratings through CRAs. The review also looks into recent regulatory developments through grey literature. Section 2.2.1 provides a detailed explanation of the methods used to identify and analyze scientific literature and gray literature. This chapter also outlines the criteria for source inclusion and the search strategies applied.

By integrating these two types of sources, the review ensures a comprehensive understanding of the topic, capturing both academic insights and practical perspectives. The focus area of the paper is illustrated in Figure 2.1.

[1] https://scopus.com/home.uri
[2] https://scholar.google.com/

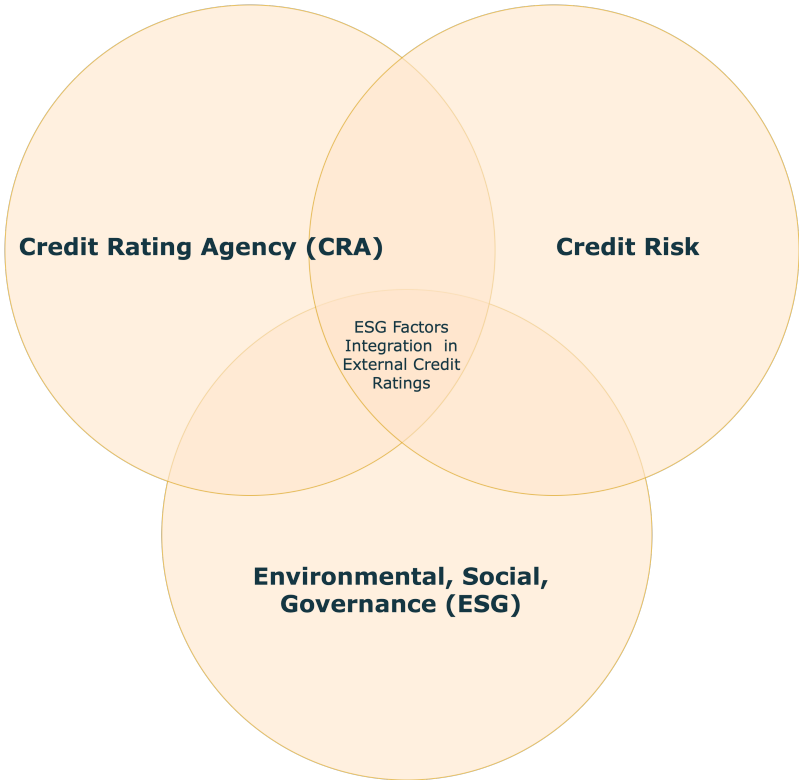


Figure 2.1: Focus area study.

2.2 Paper Selection

This section will handle the process of the paper selection in the systematic literature review based upon the framework provided by PRISMA [11]. This section will cover the data sources used, the search query that was used, the selection criteria for the papers, the extraction and synthesis processes, and ultimately the papers that were obtained.

2.2.1 Data Sources

For this systematic literature review, Scopus and Google Scholar are used as the data sources. The review attempts to reduce the chance of missing significant research and raise the chances of gathering a more representative sample of the available literature by including possible external papers as well [11]. The selected databases were chosen because of their extensive coverage of academic works from numerous disciplines and their standing as a dependable resource for academic study. The strategic integration of multiple databases reflects the paper's commitment to conducting a systematic literature review that is reflective of the various dimensions inherent to the subject matter.

2.2.2 Selection Criteria

The selection criteria is based on the relevancy of the following factors: general information (title, authors, year of publication, number of citations), results, and the mentioned developments in the paper. These selection criteria were set based on the criteria set by PRISMA [11]. In this systematic review, only papers including the keywords around the topics credit risk, ESG, and credit rating agencies are included, as can be seen in Table 2.2.

Information about the various selection criteria chosen for this systematic literature review is provided in Table 2.1. It indicates whether a specific criterion is part of (included) or excluded from the review.

Table 2.1: Paper selection criteria.

Criteria	**Decision**
Inclusion of pre-defined keywords in title, abstract, or keyword list	Inclusion
Article publication in a scientific journal	Inclusion
Article written in English	Inclusion
Article published before 2016	Exclusion
Duplicates of an original article	Exclusion
Relevance of abstract, title, and content to research objective	Exclusion
Article has no citations	Exclusion

2.2.3 Search Queries

To conduct a thorough search, the paper harnesses the advanced search options available in Scopus and Google Scholar. The search query aims to find and summarize the state-of-the-art research developments in the areas of credit risk, ESG, and credit rating agencies. The query intends to retrieve a wide range of academic articles, conference papers, and other relevant works. Table 2.2 shows the different keywords used in the search query.

Table 2.2: Keywords: Scopus database.

Credit Risk	*ESG*	*Credit Rating Agencies*
Default Risk	Environmental	Credit Rating Agency
Credit Exposure	Social	External Credit Assessment Institutions
Credit Default	Governance	ECAI
Risk of Default	Sustainability	CRA

These keywords, in combination with logical operators 'AND' and 'OR', facilitated the crafting of search queries, which are listed below. The query targeted keywords, abstracts, and titles of articles in the initial retrieval phase. The queries are constructed by looking at the various intersections of topics shown in Figure 2.1. The total documents retrieved are related to the number of documents found in the Scopus query. Additionally, Google Scholar papers were added manually.

- ◇ **Credit Risk & ESG (CRESG):**
  ('Credit' AND ('Risk' OR 'Default' OR 'Exposure') AND ('ESG Integration' OR 'ESG Score' OR 'ESG Rating' OR 'Sustainable Finance' OR 'Environmental Impact' OR 'Social Impact' OR 'Governance Risk'))
  [Scopus] *Total Documents Retrieved: 18*

- ◇ **Credit Risk & Credit Rating Agencies (CRCRA):**
  ('Credit Risk' OR 'Credit Default' OR 'Risk of Default') AND ('Credit Rating Agency' OR 'External Credit Assessment Institutions' OR 'ECAI') AND ('Credit

Scoring' OR 'Risk Assessment Models' OR 'Methodology' OR 'Quantitative Models' OR 'Risk Management' OR 'Stress Testing')
[Scopus] *Total Documents Retrieved: 118*

- ◇ **ESG & Credit Rating Agencies (ESGCRA):**
(('Credit Rating Agency' OR 'External Credit Assessment Institutions' OR 'ECAI' OR 'CRA') AND ('ESG' OR 'Environmental' OR 'Social' OR 'Governance' OR 'Sustainability') AND ('Methodology' OR 'Integration' OR 'Framework' OR 'ESG Scoring' OR 'Banking' OR 'Corporates' OR 'Financial Institutions'))
[Scopus] *Total Documents Retrieved: 62*

2.2.4 Selection Process

The study's quality, transparency, and reliability are improved by following the PRISMA principles in this study [11]. As discussed in Section 2.2.2, only papers using English language were used. In addition, various case studies and systemic review papers were excluded due to their irrelevance for this study.

The analysis was first reduced by criteria such as language (only English), publication year (2016-2024), and type of paper (articles or conference papers). This yielded a resulting number of 18 papers related to CRESG, 118 papers for CRCRA, and 62 for the last query ESGCRA (see Section 2.2.3 for the queries).

Subsequently, to address the possibility of duplicate papers from the queries, a comprehensive analysis was conducted on the retrieved papers to determine the frequency of each individual paper within the chosen database. In the presented data, it was found that 5 papers were identified twice. Subsequently, the total of 5 duplicate papers were systematically removed from the dataset.

In the final phase, titles and abstracts of the remaining articles were analyzed to exclude any deemed non-pertinent to the research objectives. This results in the final extraction of 19 papers from Scopus and 3 from Google Scholar, resulting in a total of 22 papers. The final selected papers can be found in Appendix A.

2.3 Deconstructing the Research Landscape

This section is structured into two parts, each providing a unique lens to examine the scholarly work surrounding the integration of ESG factors in credit risk by ECAIs and the regulatory landscape for this matter.

First, an examination of the temporal progression of the scholarly discourse is conducted on the topics of CRESG, CRCRA, and ESGCRA (see Section 2.2.3). As illustrated in Figure 2.2, which depicts the annual distribution of the articles without the duplicates, the literature's pace has been increasing over the past eight years (2016-2024). The rise of publications over the years show a potential surge of interest on the topic of integration of ESG in credit ratings in the most recent year, showing the relevance of the topic.

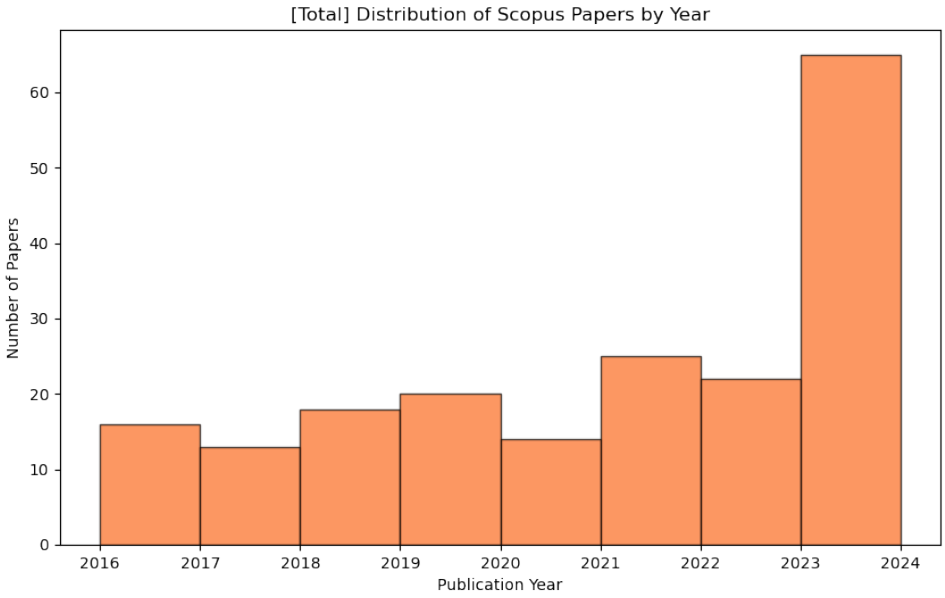
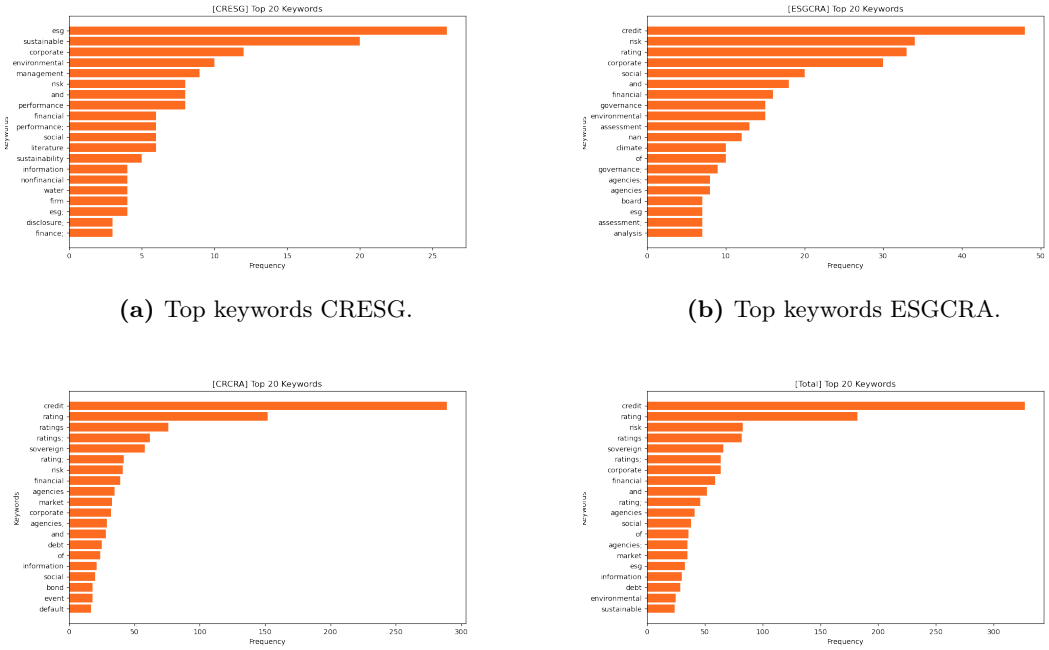


Figure 2.2: Distribution of all papers by year.

The rise of publications has also been the case for all the individual topics (see Figure 2.2). The analysis of the temporal distribution reveals that the chosen subject demonstrates a growing significance over time.

The second part of the deconstructing of the research landscape handles the journal distribution of the collected literature. This should provide insights into the diversity and reach of the research community addressing these topics. In order to gain a comprehensive understanding of this dispersion, the study utilized a systematic approach. The study conducted a scanning procedure to categorize each paper into one or more of the specified topics, namely CRESG, CRCRA, and ESGCRA (see Section 2.2.3).

The results of this categorization were then organized further into an analysis of the keywords for every search query defined in Section 2.2.3. This resulted in the overview presented in Figure 2.3. The image displays bar charts of the top 20 keywords from the different queries: CRESG, ESGCRA, CRCRA, and a combined total. The frequency of keywords like "credit," "rating," "risk," and "ESG" varies across categories, highlighting differing emphasis on ESG and financial terms in each analysis.



(a) Top keywords CRESG.

(b) Top keywords ESGCRA.

(c) Top keywords CRCRA.

(d) Top keywords in total.

Figure 2.3: Overview of the keywords across the search results gathered from Scopus database.

2.4 Findings of the Literature

The role of ESG factors in credit ratings has become a increasingly important theme in financial markets, reflecting a growing importance of sustainable practices in (corporate) credit assessments. Bhattacharya & Sharma is one of the studies that examined the integration of ESG factors into credit ratings, exploring their implications for financial markets, investment decisions, and long-term financial performance [12]. The following analysis highlights the identified themes found across the research papers on this subject.

A key finding in the literature is the increasing relevance of environmental factors, particularly climate change, on credit rating decisions. Studies show that sovereign credit ratings (SCRs) and corporate ratings are increasingly influenced by environmental risks, such as carbon dioxide emissions, renewable energy adoption, and climate change mitigation efforts [13] [14] [15] [16]. Countries and companies that are exposed to high environmental risks, particularly those with poor environmental performance, face downward pressure on their credit ratings [17] [14]. For instance, countries with high levels of carbon dioxide emissions and low renewable energy adoption are seen as more vulnerable to climate-related risks, resulting in lower credit ratings [13] [17]. Additionally, governance and social factors are also important to rating decisions[3]. Strong corporate governance practices, such as transparency, board structure, and shareholder rights, contribute to higher credit ratings, while weak governance and social performance, including issues like labor rights violations or poor stakeholder engagement, result in lower ratings [12]. The integration of these ESG

[3]Studies by Ziolo et al. and Bhattacharya & Sharma have shown that governance practices (such as transparency, board structure, and shareholder rights) and social factors (such as labor rights and stakeholder engagement) are important in determining credit ratings. Poor governance and social performance lead to lower ratings, as they pose risks to long-term financial stability [14] [12].

factors into credit assessments reflects the growing awareness of non-financial risks and their potential to affect long-term financial stability, according to Klusak et al. [17].

The methodologies used by CRAs to integrate ESG factors into their credit ratings vary. Some agencies, such as Moody's, have incorporated governance and social factors into their traditional rating frameworks, while others, like Fitch, have introduced separate ESG scores but remain cautious about directly incorporating environmental factors into their ratings [13] [14]. The diversity in methodologies shows the challenges associated with integrating ESG data into credit ratings. One of the main issues identified in the research is the lack of standardized ESG metrics. This inconsistency in ESG data reporting complicates the rating process and makes it difficult for investors to compare companies or countries based on their ESG performance [17]. To address these challenges, some studies have employed advanced analytical methods, such as Support Vector Machines (SVM), to forecast credit ratings using both financial and ESG data [18], while others have used fuzzy-set qualitative comparative analysis (fsQCA) to assess the factors influencing credit ratings [19]. These approaches demonstrate the increasing reliance on publicly available data and advanced modeling techniques to improve the accuracy and consistency of ESG integration in credit ratings [18].

Another common theme across the research is the significant role that ESG factors play in mitigating financial risk and improving long-term financial performance. Bernadelli et al. emphasizes that companies and countries that integrate ESG practices tend to experience lower risks and better long-term returns [20]. The incorporation of sustainable practices not only helps mitigate risks related to climate change, social issues, and governance failures but also creates opportunities for companies to engage with a growing market of environmentally and socially conscious investors. These investors are increasingly prioritizing ESG factors in their decision-making processes, as evidenced by the rise in sustainable investment assets in recent years [21]. This trend has led to a greater emphasis on ESG ratings, which, in turn, influence the creditworthiness of firms and sovereign entities [21]. Furthermore, banks and financial institutions that continue to finance fossil fuel projects are often penalized in their ESG ratings, reflecting a broader shift towards sustainable financing in the global financial system [20].

The impact of climate change on sovereign credit ratings is a particular focus of several studies. Research by Klusak et al. and Bernadelli et al. indicate that climate risks, including extreme weather events, resource scarcity, and the economic costs of climate change, are likely to lead to sovereign downgrades, particularly in the absence of climate adaptation policies [17] [20]. For example, Klusak et al. predicts that climate-induced sovereign downgrades will become more frequent by 2030, with the intensity of these downgrades increasing over time, particularly under high-emission scenarios [17]. The research suggests that countries that implement stringent climate policies consistent with the Paris Agreement are better positioned to mitigate the impact of climate change on their credit ratings [17]. However, for countries that fail to adopt effective climate policies, the economic and environmental risks could significantly harm their creditworthiness [17].

Beyond environmental risks, the social and governance factors are also becoming increasingly important in credit assessments. These factors include a government's ability to manage social unrest, maintain political stability, and implement effective policies. Countries with strong governance structures and effective social policies are seen as better able to manage long-term risks and maintain economic stability. In contrast, countries with weak governance and poor social policies are more likely to face credit rating downgrades [17]. However, environmental risks, such as the effects of natural disasters or resource scarcity, tend to have more immediate impacts on sovereign credit ratings than social and gov-

ernance factors, highlighting the urgent need for governments to address environmental challenges [17].

Studies by Lim & Goh and Chi & Flynn suggest that regulatory frameworks aimed at improving ESG transparency and standardizing ESG data will play a crucial role in enhancing the integration of ESG factors into credit ratings. The EU's Corporate Sustainability Reporting Directive (CSRD)[4] and the Task Force on Climate-related Financial Disclosures (TCFD)[5] are two such initiatives that seek to improve ESG disclosure and reporting, which could lead to more consistent and reliable ESG data [13] [21]. As more data becomes available and as global financial markets continue to shift towards sustainability, CRAs are likely to refine their methodologies to incorporate ESG factors more directly into their credit assessments. The ultimate goal is to ensure that credit ratings reflect not only financial risk but also the long-term sustainability of the entities being rated [21].

Across the various studies explored in the literature, it is evident that ESG factors are becoming an essential part of credit ratings, with a growing recognition that these non-financial factors significantly affect both corporate and sovereign creditworthiness. The integration of ESG risks into credit assessments reflects the broader shift towards sustainable finance. While challenges remain in standardizing ESG data and methodologies, the trend towards deeper ESG integration is clear. As ESG factors continue to gain prominence, their influence on financial markets and credit ratings is likely to intensify and will transform the future of credit assessments and investment strategies. Most of the literature reviewed emphasizes the *environmental factors of ESG*, particularly the risks posed by climate change. There is a clear and urgent need for concrete solutions to mitigate these risks, as environmental issues increasingly drive credit rating downgrades. Studies such as Klusak et al., as discussed earlier, highlight that without significant policy changes and effective climate adaptation strategies, countries and companies alike will face more frequent and severe financial consequences [17]. Therefore, this thesis will provide an enhanced focus on the climate-related risks for credit risk, as these ESG risks are mostly discussed and concretized by literature.

The need for better ESG data, improved regulatory frameworks, and the transition to greener economies is not only necessary for sustainability but is also critical for keeping financial stability within financial institutions. The usage of methodologies by CRAs has not been elaborately addressed in literature, which could to support ESG credit decisions. This shows a finding of a gap in literature where this thesis will focus on.

[4] https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

[5] https://www.fsb-tcfd.org

Chapter 3

Context Description

3.1 Fundamentals of Credit Risk

Credit risk refers to the possibility that a borrower or counterparty will fail to meet their obligations to repay a loan in accordance with the agreed terms [22]. This risk is a fundamental concern for financial institutions, lenders, and investors, as it directly impacts the likelihood of recovering the full value of a loan or investment. For most banks, loans are the largest and most obvious source of credit risk [23]. If a bank has indications that a loan may not be fully repaid, such as past due payments, it should acknowledge the potential loss and establish provisions, also referred to as reserves or allowances [24]. Managing these risks accordingly would promote financial stability within the sector.

For measuring credit risk, banks can use various approaches, as visualized in Figure 3.1, to determine whether it fulfills its capital requirements [25]. The approaches defined in the Basel Accords[1] include the Standardized Approach (SA)[2], the Foundation Internal Ratings-Based Approach (FIRB), and the Advanced Internal Ratings-Based Approach (AIRB)[3] (see Figure 3.1).

[1] The Basel Accord, developed by the Basel Committee on Banking Supervision (BCBS), sets out international standards for banking supervision. Under Basel II and Basel III, financial institutions are required to have robust credit risk models in place to assess and manage their credit risk[26]. These models need to incorporate a range of components, including PD, LGD, and EAD [26].

[2] For more information on the SA, follow this link [27].

[3] For more information on the IRB, which is an overarching term for both FIRB and AIRB, follow this link [28].

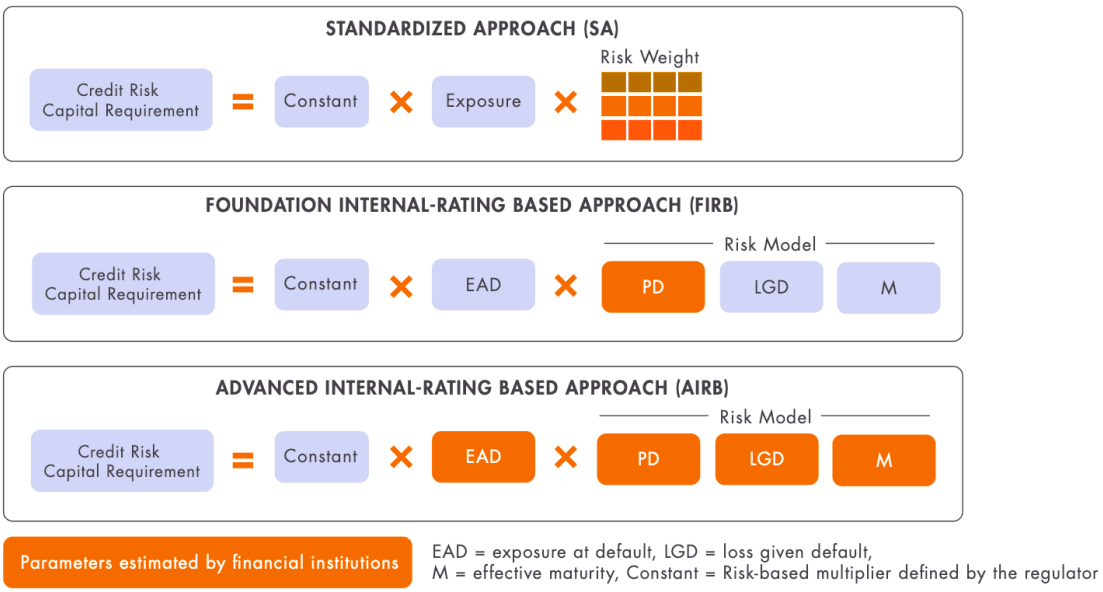


Figure 3.1: Possible calculation methods for the credit risk [29].

Each of the approaches in Figure 3.1 (SA, FIRB, AIRB) differ in terms of complexity, data requirements, and the degree of reliance on internal models. The FIRB and AIRB approaches provide larger and more advanced banks with the flexibility to use their internal models to estimate risk components, such as PD, LGD, and EAD. This will be elaborated upon in the coming sections.

3.1.1 Determining Risk: Standardized Approach (SA)

The SA is the simplest method and the most common approach adopted by institutions in the EU for calculating capital requirements for credit risk [30]. The SA aims to ensure that banks hold enough capital to cover potential credit losses. It is widely used by smaller or less complex financial institutions because it does not require advanced internal modeling, which is the approach taken by larger banks [31]. Instead, it relies on predefined rules and external ratings to assign risk weights to exposures [27]. Risk weights are a fundamental aspect of the SA, representing the credit quality of borrowers or counterparties. Regulators assign these weights based on external credit ratings provided by external credit assessment institutions (ECAIs). A more detailed description of the role of ECAIs in credit risk is provided in Section 3.2.

> *"To determine the risk weights in the standardized approach for certain exposure classes, in jurisdictions that allow the use of external ratings for regulatory purposes, banks may, as a starting point, use assessments by external credit assessment institutions that are recognized as eligible for capital purposes by national supervisors."*
> Bank for International Settlements (BIS). December 8, 2022 [27]

In the Basel framework cited above, asset classes[4] eligible for ratings by ECAIs, are

[4]Examples provided by BIS include sovereigns, non-central government public sector entities (PSEs), multilateral development banks (MDBs), banks, covered bonds, securities firms and other financial insti-

assigned specific risk weights based on their credit quality [27]. Table 3.1 provides an overview of the assigned risk weights for corporate institutions. The process uses credit quality steps (CQS), a standardized scale that translates ECAI ratings (e.g., AAA, AA, A) into categories ranging from CQS 1 (highest credit quality) to CQS 6 (lowest credit quality). Table 3.1 compares the credit rating equivalencies from major ECAIs (Fitch, Moody's, and S&P) for each CQS. The CQS are associated with the credit rating assessments of major ECAIs, specifically Fitch Ratings (Fitch), Moody's Investors Service (Moody's), and Standard & Poor's (S&P). These assessments determine the corresponding risk weights used in the Basel framework.

Table 3.1: Credit quality steps and corresponding risk weights by the European Banking Authority (EBA), based on the Basel framework [32].

Credit Quality Step (CQS)	Fitch's Assessments	Moody's Assessments	S&P Assessments	Corporate
1	AAA to AA$^-$	Aaa to Aa3	AAA to AA$^-$	20%
2	A+ to A$^-$	A1 to A3	A+ to A$^-$	50%
3	BBB+ to BBB$^-$	Baa1 to Baa3	BBB+ to BBB$^-$	100%
4	BB+ to BB$^-$	Ba1 to Ba3	BB+ to BB$^-$	100%
5	B+ to B$^-$	B1 to B3	B+ to B$^-$	150%
6	CCC+ and below	Caa1 and below	CCC+ and below	150%

The CQS for the SA are defined by the European Banking Authority (EBA) and the corresponding risk weights are applied to corporate exposures [32]. Each CQS is linked to a predefined risk weight that reflects the credit risk associated with the asset. For instance, corporate exposures rated as AAA or AA (CQS 1) are assigned a 20% risk weight, while those rated as BBB (CQS 3) are assigned a 100% risk weight. For corporate exposures rated below B- (CQS 6), a higher risk weight of 150% applies, reflecting the increased credit risk. This system ensures a consistent approach to risk assessment across various asset classes. In cases where external ratings are not available, exposures are categorized into asset classes or residential mortgages, with predefined risk weights applied to each category [27]. However, this could potentially lead to a more conservative estimation of capital requirements.

3.1.2 Determining Risk: Internal-Rating Based (IRB) Approach

Banks may use their own internal models to estimate key risk parameters under the IRB approach [28]. However, before these models can be used to calculate risk-weighted assets, they must first receive initial approval from ECB Banking Supervision [9]. Once approved, the models are subject to periodic investigations and continuous monitoring by ECB Banking Supervision [9]. This ensures that banks consistently meet the requirements for utilizing internal models [9].

The IRB approach to credit risk modeling is an important aspect of Basel[5], which allows banks to model their own inputs for calculating risk-weighted assets from credit exposures to retail, corporate, financial institution and sovereign borrowers, subject to supervisory approval. With approval from regulatory institutions, banks can utilize these IRB models to calculate their regulatory capital. The IRB approaches, depicted in Figure 3.1, are more advanced and demand greater effort and precision compared to the SA [34]. However, these

tutions, corporates, subordinated debt, equity and other capital instruments, retail exposures, real estate exposure, etc. [27].

[5]The Basel Framework is the full set of standards of the Basel Committee on Banking Supervision (BCBS), the primary global standard setter for the prudential regulation of banks [33].

approaches typically result in lower capital requirements than those calculated using the SA, a favorable outcome for banks, as it frees up more capital for other activities [34]. Within the IRB approach, there are two levels: the FIRB approach, where banks estimate the PD while regulators provide other risk parameters, and the AIRB approach, where banks are allowed to estimate all risk parameters[6], including PD[7], LGD[8], and EAD[9], provided they meet more stringent regulatory requirements [25]. The result is a more efficient use of capital and better risk management [25].

The credit risk assessment process relies on four key components to estimate potential losses: Probability of Default (PD), Exposure At Default (EAD), Loss Given Default (LGD), and Maturity (M) [28]. The relationship between these components can be summarized in the Expected Loss (EL)[10] formula, which estimates the financial institution's total potential credit loss [35]. The explained framework enables financial institutions to measure and manage credit risk effectively while ensuring compliance with regulatory standards:

$$EL = PD \times LGD \times EAD \tag{3.1}$$

- ◇ `Probability of Default (PD):` PD represents the likelihood that a borrower will fail to meet their financial obligations within a given time frame, typically one year, as can be derived from the definition provided by the Bank for International Settlements (BIS) [36].

  > *"For corporate, sovereign and bank exposures, the PD is the one-year PD associated with the internal borrower grade to which that exposure is assigned. The PD of borrowers assigned to a default grade(s), consistent with the reference definition of default, is 100%. The minimum requirements for the derivation of the PD estimates associated with each internal borrower grade are outlined in CRE36.77 to CRE36.79."*
  > Bank for International Settlements (BIS). December 17, 2019 [36]

  All banks are required to provide supervisors with internal estimates of the PD for borrowers in each borrower grade [28]. These PD estimates must present a conservative perspective, reflecting the long-term average PD for the specified grad [28]. To ensure accuracy, the estimates must be based on historical data and supported by empirical evidence. Furthermore, the processes involved in developing these estimates, such as risk management practices and borrower rating assignments, must fully comply with supervisory minimum requirements. This includes adhering to guidelines for internal usage and public disclosure of the estimates to meet the criteria for IRB recognition [28].

- ◇ `Loss Given Default (LGD):` LGD quantifies the portion of the exposure that is not recoverable after a default [35]. LGD is a crucial metric for financial institutions,

[6] This approach makes use of the bank's own internal models, tailored to their own data. These models must comply with certain conditions set by regulators [25].

[7] Probability of Default (PD): Likelihood a borrower will default.

[8] Loss Given Default (LGD): Portion of exposure likely to be lost if default occurs.

[9] Exposure at Default (EAD): Total exposure at the time of default.

[10] An important figure for any financial institution is the cumulative amount of expected losses on all outstanding loans [35]. A bank must sum the EL amount (defined as EL multiplied by exposure at default) associated with its exposures to which the IRB approach is applied (excluding the EL amount associated with securitisation exposures) to obtain a total EL amount [36].

used to estimate the potential losses they may incur when borrowers default on their loans [35].

> *"A bank must provide an estimate of the LGD for each corporate, sovereign and bank exposure. There are two approaches for deriving this estimate: a foundation approach and an advanced approach. As noted in CRE30.34, the advanced approach is not permitted for exposures to certain entities."*
> Bank for International Settlements (BIS). December 17, 2019 [36]

- ◇ `Exposure At Default (EAD)`: EAD represents the total value a bank stands to lose if a loan defaults [37]. Banks typically rely on internal risk management models to estimate EAD for their respective systems [37].

> *"In the foundation approach, EAD is calculated as the committed but undrawn amount multiplied by a credit conversion factor (CCF). In the advanced approach, EAD for undrawn commitments may be calculated as the committed but undrawn amount multiplied by a CCF or derived from direct estimates of total facility EAD. In both the foundation approach and advanced approaches, the definition of commitments is the same as in the SA, as set out in CRE20.94."*
> Bank for International Settlements (BIS). December 17, 2019 [36]

- ◇ `Maturity (M)`: Maturity mismatches are not allowed (see CRE22.10 to CRE22.11 [36]). This means that the maturity of the credit protection instrument must match the maturity of the underlying exposure. Any deviation where the credit protection expires before the underlying exposure is fully repaid would constitute a maturity mismatch. Institutions are required to ensure that the duration of the credit protection is consistent with the duration of the exposure [36].

3.1.3 Regulatory Developments in Credit Risk

Credit risk model regulations differ across jurisdictions, aiming to safeguard the stability and reliability of financial institutions. These regulations focus on enhancing transparency, precision, and uniformity in credit risk modeling methodologies [26]. Following the financial crisis, the EU embarked on wide-ranging reforms of its banking rules to increase the resilience of the EU banking sector [38]. The current framework is structured around three main pillars: minimum capital requirements (Pillar 1), supervisory review processes (Pillar 2), and market discipline (Pillar 3) [6]. Pillar 3 specifically focuses on fostering market discipline by mandating that banks regularly disclose both qualitative and quantitative information [6]. These disclosures, which aim to improve transparency, are typically included in financial reports or standalone Pillar 3 reports [6].

On 27 October 2021, the European Commission (EC) adopted a review of EU banking rules, which led to changes in regulation [38]. The new regulations aim to strengthen the resilience of EU banks against future economic shocks, support Europe's recovery from the COVID-19 pandemic, and facilitate the transition to climate neutrality [38]. These rules refer to the CRR/CRD regulatory framework, commonly referred to as the CRD package, comprises the Capital Requirements Directive (CRD) and the Capital Requirements Regulation (CRR) [39]. This framework, which has been subject change over the last few years as can be seen in Figure 3.2, is designed to enhance banks' resilience by bolstering their solvency and liquidity positions and improving their risk management practices [40].

Figure 3.2: The CRR has been evolving since 2013, following changes in the Basel agreements [41].

The newly created CRR3[11] will bring major changes to the way banks manage credit risk and will have a significant impact on the current banking industry [42]. An outcome of the CRR3 is the narrowing of the scope of exposures eligible for IRB models for credit risk. To enhance harmonization across institutions and improve the comparability of IRB model outcomes, the EC has revised the IRB framework, introducing limits on its application [42]. The CRR3 limits the use of the AIRB approach only to exposure classes where robust modeling is deemed feasible (e.g., exposures to large corporates or institutions), while other exposure classes will be migrated to less sophisticated methods (i.e., under the FIRB or standard approach) [42]. Also, input floors are introduced to establish minimum levels of own estimates (i.e., PD, LGD, EAD) within the IRB framework. This floor is set at 72.5% of the own funds requirements that would apply based on the SA [41]. The introduction of the output floor results in the application of the following equation (Equation 3.2):

$$\underset{\text{(TREA)}}{\text{Total Risk Exposure Amount}} = \max\left\{\underset{\text{TREA}}{\text{Internal rating-based}},\ 72.5\% \times \underset{\text{TREA}}{\text{Standardized}}\right\} \tag{3.2}$$

Ultimately, this implies that financial institutions will be required to calculate both the IRB and SA to make sure this output floor is respected [41]. Institutions are required to calculate their Total Risk Exposure Amount (TREA) to ensure that those using internal models achieve at least 72.5% of the TREA derived from the SA [41]. Sovereign exposures, however, are exempted from the application of the new input floors [42]. Further changes include the deletion of the scaling factor in the risk weight formula. Figure 3.3 shows the expectation for the gradual enforcement of the output floor, which should enforce a 72.5% floor by 2030 [41].

[11] For more information about the CRR3/CRD4 or "banking package", follow this link [39].

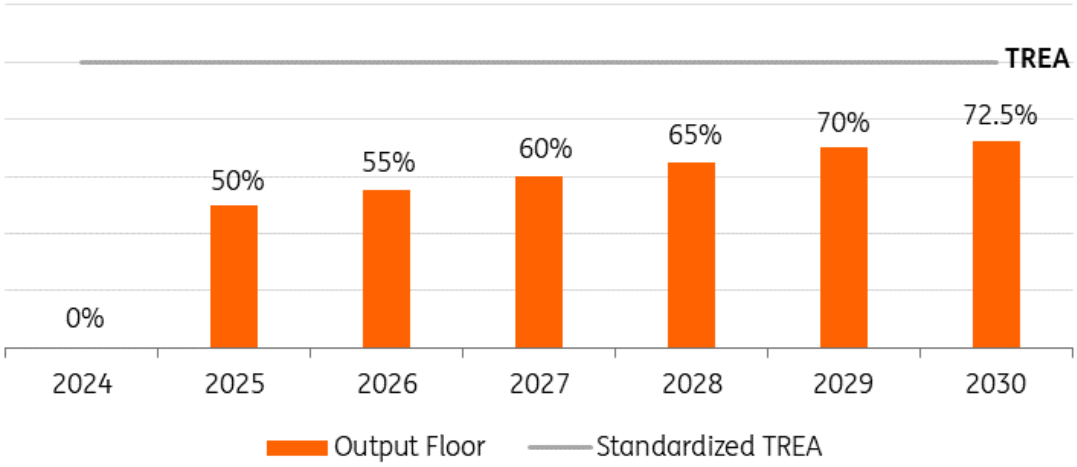


Figure 3.3: Output floor is expected to be enforced gradually as of January 2025 [41].

3.2 Credit Rating Agencies (CRA)

Since John Moody started his first small rating book in 1909, the credit rating industry has grown into a multi-billion-dollar enterprise [43]. External credit assessment institutions (ECAIs) or credit rating agencies (CRAs)[12] play an important role in financial markets through the production of credit risk information and its distribution to market participants [43]. During the last decades, CRAs have played a significant role in shaping the financial market [45]. The impact of their opinions, evaluations, and ratings is based on the notion that credit ratings are a measure of risk [45]. ECAIs refer to CRAs that issue and/or endorse credit assessments about entities and debt instruments in the form of credit ratings [4]. The CRD[13] permits institutions to use external credit assessments for determining the risk weight of their exposures [46]. This is allowed only if the ECAIs providing these assessments have been deemed eligible by the appropriate supervisory authorities [46].

An ECAI is a CRA recognized in the European Union (EU)[14] for the purposes of Article 113(1) of the CRR [47]. These assessments, commonly known as credit ratings, play a crucial role in financial markets by guiding investment decisions and influencing regulatory requirements for financial institutions. As provide critical financial insights to market participants, primarily through ratings that estimate the PD for specific debt issuers. In recent years, there has been growing interest in the credit rating process, particularly the criteria used by CRAs to evaluate debt issuers [18]. Consequently, external ratings have become more central to risk assessment and to determining the capital requirements imposed on banks by supervisory authorities. Countries typically maintain long-term contracts with CRAs and pay for their services, as they are dependent on the credit ratings essential for accessing capital markets and minimizing borrowing costs [19].

[12] An ECAI is defined in CRR Article 4(98) as a CRA registered or certified according to CRA Regulation, or a central bank issuing credit ratings which are exempt from the CRA regulation [44].

[13] The CRD refers to Directive 2006/48/EC and Directive 2006/49/EC.

[14] For more information about the guidelines on the recognition of CRAs as ECAIs, follow this link, which provides the guidelines set by the European Banking Authority (EBA).

3.2.1 The Impact of CRAs in the Financial Market

Before the financial crisis of 2008, CRAs operated with minimal regulation [48]. In the aftermath of the global financial crisis, the role of CRAs gained importance but also came under significant questioning for the reliability and accountability of its actions [18]. Many observers argued that CRAs significantly underestimated the credit risk of structured credit products[15] [43]. This recognition was shared among policymakers, market participants, and the agencies themselves [49]. It soon became clear that, given the depth of the crisis, CRAs would not be able to satisfy policymakers by eliminating flaws in their rating methods and improving corporate governance. However, the onset of the crisis prompted growing demands from politicians for stricter regulatory oversight [48].

Over the years, the significance of CRA judgments has increased with regard to Europe, where many bank-based coordinated market economies have substituted former non-market institutions by external rating practices [19]. This process of evaluation and providing external credit ratings is dominated by a small number of influential actors, with first and foremost the major US rating agencies Standard & Poor's (S&P), Moody's and Fitch Ratings [19]. This can be seen in Table 3.2 for their respective market share from 2022 according to the European Securities and Markets Authority (ESMA) [50]. ESMA identifies DBRS and Scope Ratings as alternatives due to their broad credit rating coverage in Europe [51]. CRA announcements by different agencies differ in their impact, where study suggests the rating announcements by Moody's tend to have the strongest persistence effect [52].

Table 3.2: Market share of the major CRAs (S&P, Moody's and Fitch) according to ESMA [50].

Name of CRA	**Market Share**
S&P Global Ratings	50.13%
Moody's Investor Service	32.79%
Fitch Ratings	10.05%
Other CRAs	7.03%

3.2.2 Establishing External Credit Ratings by CRAs

A credit rating represents an assessment of creditworthiness, expressed through a structured ranking system of rating categories [53]. Credit rating agencies, such as S&P, assess corporate entities and nations based on their PD [12]. Credit ratings possess the following characteristics [53]:

1. They are issued on a professional basis.
2. They are associated with a specific financial instrument, obligation, or issuer.
3. They rely on analytical input provided by rating analysts.
4. They are either disclosed publicly or distributed via subscription.

The process of establishing external credit ratings involves a systematic evaluation of an entity's creditworthiness by CRAs (see Section 3.2.2.1). This creditworthiness is expressed

[15] The International Monetary Fund (IMF) found that more than three quarters of all private residential mortgage backed securities issued in the United States from 2005 to 2007 that were rated AAA were later rated below BBB- (i.e., below investment grade) [43].

using standardized scales that facilitate comparisons across issuers and industries (see Section **??**). The objective of credit ratings is to reduce information asymmetry between lenders and borrowers regarding the latter's creditworthiness. CRAs must, according to the CRA Regulation (CRAR) by ESMA:

1. Disclose to the public the methodologies, models, and key rating assumptions it uses in its credit rating activities [53]. Study argues that high disclosure quality (DQ) enables firms to convey information ahead of the credit rating action [21]. In contrast, firms with low DQ experience significant stock price reactions because the rating action conveys more new information to the market [21].
2. Adopt, implement, and enforce adequate measures to ensure that the credit ratings and rating outlooks it issues are based on a thorough analysis of all available and relevant information according to the applicable rating methodologies [53].
3. Issue changes in credit ratings in accordance with the applicable credit rating methodologies [53].

Under the current CRA Regulation (CRAR), CRAs must adhere to requirements designed to ensure the quality and independence of their ratings [54]. These include requirements to avoid conflicts of interest, disclose rating methodologies, and improve transparency in rating processes. Additionally, CRAs are held accountable for their ratings, thus having greater responsibility in their assessments.

3.2.2.1 Rating Methodology

A CRA must employ rating methodologies that are robust, systematic, consistently applied, and regularly validated through historical analysis, including back-testing [53]. When multiple agencies provide long-term ratings for a particular firm, one would expect these ratings to be consistent or at least similar, allowing investors to rely on any of them to evaluate potential financial risk [55]. However, this is often not the case, as the same companies are frequently rated differently by different agencies [55].

The rating methodology employed by CRAs combines qualitative and quantitative evaluations to determine the financial and operational strength of an entity. CRAs, such as S&P, Moody's, and Fitch, focus on two primary dimensions in their analysis: valuating the entity's business risk profile (business risk) and financial risk profile (financial risk) [12]. Business risk refers to such as market position, geographic diversification, sector strengths or weaknesses, and exposure to economic cycles [56]. For example, S&P incorporates factors such as country risk, industry risk, and competitive position for its business risk[16] [12]. It evaluates an entity's ability to compete (competitive positioning), its stability across regions (country risk), and its resilience to market pressures (industry risk) [56]. Financial risk focuses on the company's financial stability and flexibility, including profitability, liquidity, leverage, funding diversity, and future financial forecasts based on management plans [56]. Financial risk for S&P is implied by current and future cash flow generation [12].

3.2.2.2 Solicited & Unsolicited Ratings

Credit ratings could either be solicited or unsolicited. Solicited credit ratings, also known as the issuer-pays model, are deemed those that are initiated at the request of the issuer

[16] It is worth noting that the aforementioned risks are based on S&P's methodology and may vary across different rating agencies. Other CRAs are not mentioned that thoroughly in literature.

or rated entity [57]. Solicited credit ratings exist in the context of an existing contractual relationship between the CRA and the rated entity/issuer or related third party [57]. Unsolicited ratings are published by CRAs "without the request of the issuer or its agent" [58]. The role of CRAs as information producers has attracted considerable attention in the last decade [58]. Unsolicited ratings are issued without the payment of a rating fee and have been widely used since the 1990s and account for a sizeable portion of the total number of credit ratings. The reason for the existence of unsolicited ratings is that the release of these unsolicited credit ratings increases the rating agency's short-term profit as well as its long-term profit [58]. Unsolicited credit ratings tend to be lower than their solicited counterparts, meaning that for companies solicited ratings are favorable [58].

The EBA has taken measures to address concerns about the potential quality differences between solicited and unsolicited credit ratings [59]. Institutions may use unsolicited credit assessments of an ECAI for determining their capital requirements only if the EBA has confirmed that those unsolicited ratings do not differ in quality from solicited ratings of that same ECAI [59]. This decision reinforces the credibility of unsolicited ratings and their role in providing additional transparency to the market. However, the perception of bias remains, as companies generally consider solicited ratings to be more favorable [58].

In financial literature, there are controversies about CRA ratings discussing possible conflicts of interest because a CRA evaluating a firm is also its customer [60]. This is because a solicited rating arrangement inherently creates a conflict of interest: issuers are inclined to select rating agencies that provide favorable evaluations, while rating agencies, motivated to retain their clients, may offer ratings that are overly generous [5]. There may be a clear incentive to inflate the rating of a company that is funding the assessment, which undermines the fundamental purpose of a CRA's role [55]. As a result, this model poses a significant risk to the objectivity and neutrality of credit ratings, potentially undermining their reliability and credibility [5]. In the past, these judgments were more independent, as investors directly paid for access to the ratings and accompanying information about their potential investments [55]. But this ideal model has evolved towards a system where issuers themselves finance the research about their ratings [60]. However, study suggests that the issuer-pay model (where i.e. S&P is paid by the rated firm, meaning a solicited rating) does not impede the flow of negative information from firms, nor does it lead to rating agencies ignoring negative information in assigning ratings [61].

3.2.3 Role of ECAIs in Measurement Approaches

ECAIs play an important role in measuring credit risk within both the SA and the IRB approach. Under the SA, the application of risk weights is determined by classifying exposures into categories based on their credit quality, which is typically assessed using ECAI ratings [62]. Article 138 of the CRR[17] outlines the requirements for ECAIs in this context. Institutions may nominate one or more ECAIs, and if multiple ECAIs are used, the second lowest risk weight must be applied [62]. Revocations of ECAI nominations are permitted but must be justified to avoid the perception that the revocation aims to reduce capital requirements [62]. As a result, institutions have the flexibility to nominate ECAIs. However, this flexibility does not permit selective 'cherry-picking' of credit assessments when such assessments are available from a nominated ECAI [62]. The EBA outlines that ECAIs utilized under the SA must satisfy specific criteria, including objectivity, independence, ongoing review, and transparency[18] [46]. ECAI credit assessments, however, should not

[17] One can find the article within the EBA guidelines by following this link [62].

[18] These criteria are detailed in the "EBA's guidelines on the recognition of ECAIs". For more information on this documentation, follow this link [46].

be used selectively under SA [62]. Therefore, ECAIs used for IRB modeling must also be considered for SA risk-weight specification [62].

Under the IRB approach, internal models are primarily used to estimate risk parameters such as PD and LGD [28]. The PD of an obligor is estimated in a 1-year time horizon based on long-run average 1-year default rates. However, the risk differentiating factors may be defined in a way that reflects longer-term characteristics of the obligor [63]. However, according to the CRR[19], institutions may calibrate their PD models by mapping internal credit grades to those provided by ECAIs, subject to certain conditions [64]. Despite this allowance, mechanical reliance on ECAI ratings is prohibited, and institutions must perform their own due diligence[20] [65]. This ensures that ECAI input complements, rather than replaces, the rigorous analysis embedded in IRB models. For the IRB approach, the requirements are more stringent. Not all ECAIs suitable for SA are adequate for IRB due to the stricter requirements imposed on internal modeling. The BCBS specifies that banks must demonstrate the accuracy and consistency of their internal rating systems, which involves rigorous validation processes[21] and adherence to higher standards of risk quantification [28].

The regulation of CRAs in the EU has undergone significant reform since the financial crises of 2008[22] and the subsequent euro area debt crisis[23] [66]. The past crises exposed critical flaws in the operation and oversight of CRAs, particularly in their methodologies and their impact on financial stability. To address these shortcomings and restore market confidence, the EU tried to establish a robust regulatory framework (referencing the CRR) that has been progressively enhanced through three consecutive steps [66]. Frameworks such as the CRR and the ECB's guidelines have introduced new measures[24] that increase reliance on external credit ratings, while simultaneously emphasizing transparency, consistency, and accountability in their methodologies [9].

> *"As part of the resolution of the 2008/2009 financial crisis, the European regulator introduced multiple laws aimed at reducing the dependencies of market participants on credit rating agencies. However, recent changes set out in CRR2 and CRR3 now require a greater reliance on external credit ratings in order to foster financial sector stability."*
> Ernst & Young (EY). 2023 [51].

The implementation of CRR3 further increases the reliance on external credit ratings

[19] Defined under CRR Article 181(1), which requires that institutions have internal assessments for legal certainty [64].

[20] As stipulated by CRD Article 79(b), it relates to the arrangements, processes and mechanisms of institutions and aims at ensuring that institutions have in place sound credit risk management practices [65].

[21] These standards are outlined in the BCBS's documentation on the IRB approach. For more information on this documentation, follow this link [28].

[22] In the period leading up to the financial crisis in 2008, CRAs failed to properly appreciate the risks in more complex financial instruments [66].

[23] During the subsequent euro area debt crisis, certain countries were faced with abrupt bond sell-offs and higher borrowing costs following a downgrade of their credit rating [66].

[24] The CRR framework has introduced measures that increase reliance on external credit ratings. CRR2 includes a mandate-based approach (MBA) for investments in collective investment undertakings (CIUs), requiring banks to assess the underlying assets' risk weights based on external credit ratings [51]. To prevent selection bias, CRR3 mandates the use of the "second-best" external credit rating [51]. For single ratings, it uses that rating. For two ratings, the worst is selected, while for three or more, the second-best rating is applied [51]. This approach ensures that indirect investments via CIUs are treated equivalently to direct investments concerning capital requirements.

by introducing an output floor, addressing that the capital requirements calculated using internal models must not fall below 72.5% of those determined by the SA, as discussed in Section **??**. This backstop addresses concerns raised by the ECB's Targeted Review of Internal Models (TRIM), which found internal models often underestimated credit risk [51]. This compels institutions employing internal models to incorporate external credit ratings into their assessments to meet the minimum capital thresholds [9]. Regulatory developments in the CRA market are expected to influence the evolution of IRB models, reflecting the growing importance of external ratings in shaping risk assessment practices.

3.3 Environmental, Social, and Governance (ESG) Factors

The earth's climate has undergone natural fluctuations of warming and cooling throughout its history, showing that change is an inherent part of the planet's system. The greenhouse effect[25] is a vital natural mechanism that helps sustain the conditions required for life to thrive [16]. Greenhouse gases, in the right proportion, fulfill the mission to guarantee the conditions for life on earth [16].

Business-wise, climate change is seen as "the biggest market failure the world has seen", with wide-ranging implications for stability (financial, economic, political, social, and environmental) [17]. ESG standards have become a necessary consideration in the modern financial landscape [16]. Policymakers and regulators increasingly recognize climate change as a significant source of financial risk that demands attention [68]. These findings are supported by research examining the impact of climate change on sovereign credit ratings, as illustrated in Figure 3.4 [17]. One can see that opportunities of credit ratings based on climate scenarios are also identified, showing a positive notch change for sovereigns.

[25]The greenhouse effect is the process through which heat is trapped near earth's surface by substances known as greenhouse gases (GHGs) [67].

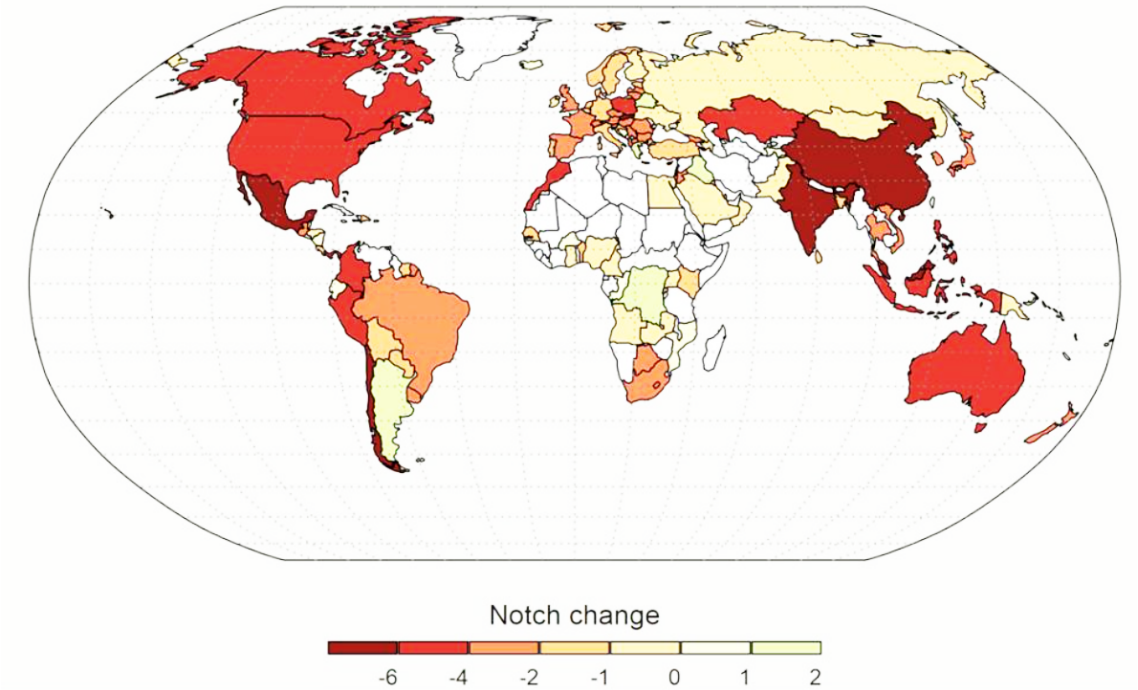


Figure 3.4: Climate-induced sovereign downgrades by 2100. Under this scenario, 81 sovereigns face downgrades by 2100, with an average ratings loss of 2.18 notches on the 20-notch scale [17].

Banks are influential in driving the global shift toward sustainability [69]. This influence was evident in 2017 when Norway's central bank recommended divesting from oil and gas to reduce financial risk, triggering a sharp decline in Europe's oil and gas share index [69]. This responsibility banks have is also acknowledged by the Paris Agreement on Climate Change in 2015, with steering the global financial flows towards a low-carbon economy key to achieving the target of limiting global temperature [69]. Growing evidence suggests that both transition risks and physical risks stemming from climate change pose substantial threats to the banking sector and could potentially lead to systemic instability within the broader financial system [68]. This necessitates a thorough understanding and evaluation of the risks these criteria pose, along with an assessment of their influence on investment decisions and financial products [16]. In recent years, non-financial factors related to ESG measures have gained increasing significance [70]. ESG risk, as a primary non-financial factor, significantly impacts the operational activities of businesses [14].

The focus on sustainability has recently been strongly advanced by the European Green Deal[26] [71]. The comprehensive plan outlines ambitious targets, including broad objectives to be achieved by 2030 and the ultimate aim of achieving climate neutrality by 2050 [72]. The EU aims via this agreement to foster sustainability and inclusiveness through commitments affecting economic systems and EU businesses [16]. The ESG concept is a powerful tool for implementing this "carbon neutral" goal of the EU [73]. In practice, it means moving towards sustainability and inclusiveness with important commitments for economic systems and for EU companies.

[26]The Green Deal is the new growth strategy of the EU. It aims to transform the Union into a modern, resource-efficient and competitive economy with no net emissions of greenhouse gases (GHG) by 2050 [71]. The European Commission has adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels [71]. For more information, follow this link.

3.3.1 Comparing ESG in Credit & ESG Ratings

Both ESG ratings and credit ratings are data-driven evaluations provided by third-party agencies [74]. However, ESG ratings possess distinct characteristics that set them apart [74]. ESG ratings and credit ratings serve distinct purposes, despite both involving the assessment of risks and opportunities associated with entities or instruments. ESG ratings primarily focus on evaluating an entity's ESG performance and its impact on stakeholders [75], while credit is an opinion regarding the creditworthiness of an entity [74]. Under the requirements of the CRA[27], a credit rating is expected to include substantial analytical input from an analyst (through qualitative factors or a qualitative judgement) [74]. ESG factors typically consider an entity's effect on and impact from the natural and social environment and the quality of its governance. However, not all ESG factors materially influence creditworthiness or credit ratings, which assess the capacity and willingness of an entity to meet its financial obligations as they come due [75]. S&P defines ESG credit factors as those ESG elements that can materially influence the creditworthiness of a rated entity or issue and for which sufficient visibility and certainty exist to include them in credit rating analysis [75].

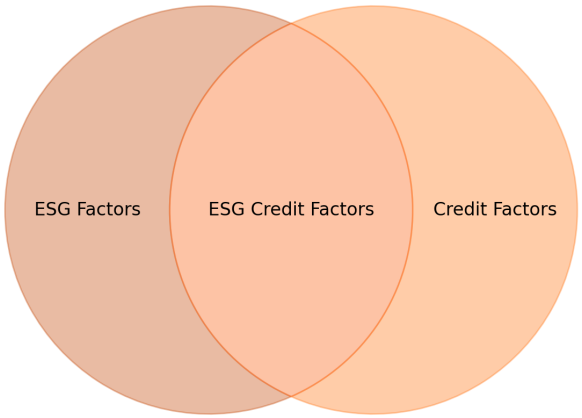


Figure 3.5: The intersection of ESG and credit risk factors [75].

Unlike credit ratings, ESG ratings tend to be only at issuer level and need to rely (limitation) on some form of qualitative input [74]. Reasoning for not providing ESG ratings on an instrumental level is that ESG-related metrics (e.g., CO_2 emissions, gender pay gap) are typically linked to the overall characteristics of the company rather than individual activities [74]. These ESG ratings assess how well a company or organization manages ESG-related risks and opportunities, often with a forward-looking perspective on sustainability practices and long-term resilience [73]. Credit ratings, on the other hand, concentrate on assessing an entity's creditworthiness, specifically its ability and willingness to meet financial obligations in a timely manner [22]. ESG factors may be integrated into credit ratings to the extent that they affect financial performance and credit risk. However, credit ratings are ultimately focused on financial risk and do not provide a holistic view of an entity's ESG performance [76]. An overview of the distinction beween ESG ratings and credit ratings is provided in Figure 3.5.

[27] Regulation (EC) No 1060/2009 on CRAs by the EU.

3.3.2 ESG Considerations in Credit Risk

Transforming the financial system to address ESG demands more than general awareness of its dangers [17]. Businesses, investors, and regulators need actionable insights grounded in science to identify the financial risks posed by ESG risks, assess their implications, and implement strategies to navigate and mitigate these risks effectively [17]. Credit risk plays a central role in the activities of credit institutions. This is evident from the fact that, on average, the majority of institutions' capital requirements are allocated to addressing credit risk [63]. The banking sector's risk profile is undergoing transformation due to the growing influence of environmental and social risks according to the EBA, which are expected to become increasingly significant over time [44]. This highlights the focus of the EBA on environmental and social risks. However, the integration of environmental and social aspects into banks' strategies and management control systems, as well as the impact of this integration on their environmental and social performance, remains largely unexplored [69]. Kiesel & Lücke investigated the extent to which CRAs incorporate ESG factors into their rating decisions [77].

Using interviews with key stakeholders and CRA representatives, research found no evidence that ESG considerations were integrated into the rating criteria at the time [77]. The authors argue that the regulatory framework for CRAs in place in 2012[28] did not address sustainability issues. Initially, studies found no significant relationship between ESG measures and firm value or profitability [70]. Nevertheless, McAdam emphasizes that a stronger focus on ESG factors could enable CRAs to offer more comprehensive evaluations of credit risks by incorporating crucial non-financial information [78].

In recent times, many financial publications and media outlets have begun focusing on issues linked to ESG developments but opinions on the impact of ESG factors on companies' financial performance vary [70]. Recent literature changed this view, for example one by Chodnicka & Jaworska, where the importance of ESG-related information is highlighted in credit policies as it could harm financial standing by increasing reputational risk, losing clients, and reducing business activity [70]. Ziolo et al. highlights that increased ESG disclosure reduces the cost of equity capital [14].

Under the SA, one uses risk weights set by the regulator for broad asset classes and based on predefined drivers (e.g. external credit ratings, loan-to-value) [68]. These broad asset classes and risk drivers have not been defined with climate risks in mind and can only indirectly capture climate risk features [68]. The SA relies, among other things, on external rating agencies to quantify risks [68]. While external CRAs are already trying to incorporate climate risks in their ratings, more work may be needed to adequately reflect these risks in the current ratings [68]. An ECAI might downgrade an issuer due to poor ESG risk management, increasing its risk weight. Understanding how ESG factors influence risk weights is crucial for banks, enabling them to adopt a forward-looking approach to forecast the impact of ESG on credit ratings assigned by ECAIs. Just like regulators and the banks themselves, rating agencies face considerable challenges with regard to incorporating forward-looking elements and general uncertainties about the impact and time horizon of ESG risk in their credit rating assessments [68].

Banks assess EL by analyzing key metrics in the IRB approach such as the PD, LGD, EAD, and Maturity (see Section 3.1.2). The IRB framework, relying on historical data and long-term probability of default (PD) estimates over business cycles, may inadequately account for future climate-related risks [68]. The estimated PD is primarily determined by the borrower's expected asset payments, debt repayment capacity, and asset volatil-

[28] While significant regulatory advancements have since occurred, this highlights that ESG integration remains a relatively recent and evolving topic with substantial room for further progress.

ity [70]. Examining various studies including one describing loan institutions across 15 EU countries, it was found that firms with stronger ESG performance benefit from a lower cost of debt [14]. Notably, the impact of ESG disclosure on the cost of debt was found to be equivalent to that of ESG performance [14]. The ESMA, however, called for greater transparency and disclosure around ESG factors, but refrained from introducing formal requirements [17].Also, addressing the unique and non-linear characteristics of climate risks may require substantial advancements in forward-looking modeling approaches [68].

3.3.3 Introduction to the Corporate Sustainable Reporting Directive (CSRD)

The updated EU banking package CRR3/CRD6 brings significant changes to how EU banks handle ESG risks, including enhanced requirements for governance, reporting, disclosure, and supervisory oversight [79]. Despite these additions, the framework stops short of mandating adjustments to capital requirements, either positive or negative, based on the influence of ESG factors [79]. In April 2021, the European Commission published a draft directive on non-financial reporting which also relates to ESG [80]. Co-legislators expanded on the European Commission's proposals (as part of the banking package for the final elements of Basel III) to strengthen measures related to ESG risks and came up with a number of aspects such as [80]:

1. Banks are required to develop transition plans under the prudential framework, ensuring these plans are consistent with their sustainability commitments outlined in other EU legislation, such as the CSRD.
2. Bank supervisors will evaluate how institutions manage ESG risks and incorporate these aspects into the annual Supervisory Review and Evaluation Process (SREP).
3. All EU banks must adhere to ESG reporting and disclosure obligations, with proportional requirements tailored to smaller banks.
4. Banks may receive preferential risk weight treatment only when financing infrastructure projects that are assessed to have a neutral or positive environmental impact.

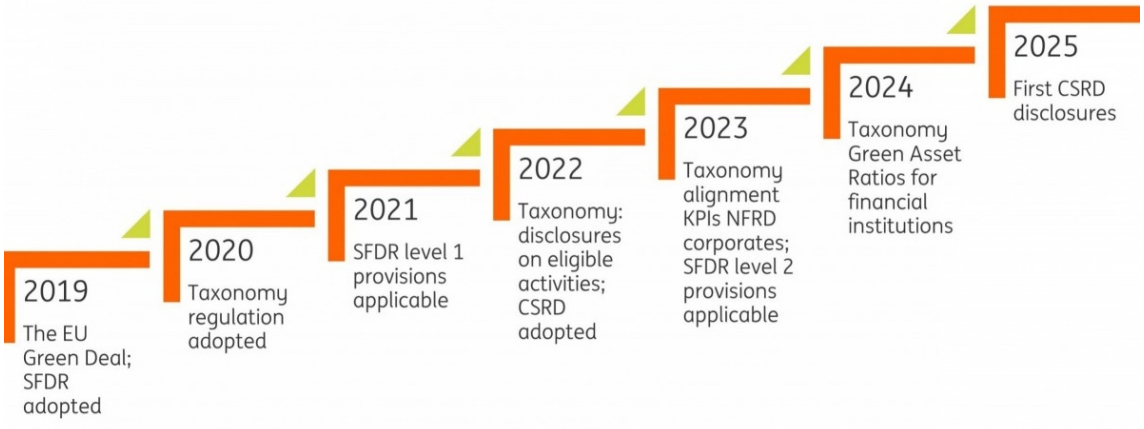


Figure 3.6: A set of frameworks and legislations to support ESG measures [72].

The CSRD (Corporate Sustainable Reporting Directive) will replace the existing NFRD (Non-Financial Reporting Directive) [70]. The CSRD entered into force on 5 January 2023

and aims[29] to help investors and other interested parties to evaluate the sustainability performance of companies as part of the European Green Deal (see Figure 3.6 for the full timeline of the integration of ESG supporting legislations and frameworks) [72]. Next to this, the CSRD imposes more reporting obligations and expands the list of entities obligated to report [70]. Under the CSRD, companies will be required to disclose information in alignment with the European Sustainability Reporting Standards (ESRS)[30] [39]. The implementation timeline mandates that the first wave of companies must adhere to these new requirements starting with their financial reports for 2024, which are to be published in 2025 (as can be derived from Figure 3.6) [39]. The EBA highlights the ongoing uncertainty regarding the impact of environmental risks on financial risk over time [83]. This uncertainty arises from the complex, non-linear, and forward-looking characteristics of environmental risks, which tend to increase gradually over time and may be accompanied by unpredictable environmental shocks [83].

The ESRS is part of the framework under the CSRD. These standards provide detailed guidelines to ensure consistency and comparability in sustainability reporting across companies. The ESRS ensures that companies provide comprehensive and standardized disclosures across these categories, enabling stakeholders to assess sustainability performance effectively. By mandating these disclosures, the ESRS aligns corporate reporting practices with the goals of the European Green Deal and enhances transparency for investors, regulators, and other interested parties. The ESRS disclosure topics are organized into three broad categories: Environment (E), Social (S), and Governance (G), as shown in Table 3.3. Each category encompasses specific areas of focus [84]:

- ◇ **Environment (E)**: This includes topics such as climate change (ESRS E1), pollution (ESRS E2), water and marine resources (ESRS E3), biodiversity and ecosystems (ESRS E4), and resource use and circular economy (ESRS E5). These topics address the environmental impacts of corporate activities and their contributions to sustainability goals.
- ◇ **Social (S)**: This covers the organization's interaction with its own workforce (ESRS S1), workers in its value chain (ESRS S2), affected communities (ESRS S3), and consumers or end-users (ESRS S4). The focus is on labor practices, community engagement, and consumer protection.
- ◇ **Governance (G)**: This focuses on business conduct (ESRS G1), emphasizing ethical practices, transparency, and accountability within organizations.

Table 3.3: ESRS disclosure topics categorized by E, S, and G [72].

Environment (E)	**Social (S)**	**Governance (G)**
ESRS E1: Climate change	ESRS S1: Own workforce	ESRS G1: Business conduct
ESRS E2: Pollution	ESRS S2: Workers in the value chain	
ESRS E3: Water & marine resources	ESRS S3: Affected communities	

[29] The Corporate Sustainability Reporting Directive (CSRD), effective since January 2023, aims to elevate the importance of sustainability reporting to the same level as financial reporting [81].

[30] In essence, the ESRS is a reporting standard that will be used to meet the requirements of the EU CSRD [82].

ESRS E4: Biodiversity & ecosystems	ESRS S4: Consumers & end-users
ESRS E5: Resource use & circular economy	

3.3.4 Integration of ESG Factors by CRAs

CRAs, in general, provide opinions on the creditworthiness of a given entity (corporate, sovereign or financial instrument) but within their analyses are a number of particular elements which make up the cumulative rating they provide, as described in Section 3.2.2 in the case of S&P. In recent years, the integration of ESG factors into credit rating methodologies has gained attention from major CRAs. In June 2018, Moody's acknowledged the influence of ESG factors on sovereign credit ratings (SCRs) [13]. With the increasing prominence of the ESG concept in the financial sector, leading CRAs have emphasized their integration of ESG considerations into their analyses [85]. However, the limited literature on this topic highlights significant differences in rating methodologies [85]. This commitment has been reinforced by their alignment with the Principles for Responsible Investment (PRI), a United Nations (UN) initiative launched in response to the financial crisis. Both S&P and Moody's are signatories to the PRI [85]. A paper by Cash indicates a growing role for ESG factors in shaping the methodologies of various CRAs [85]. For instance,ESG risks are increasingly embedded within the frameworks of CRAs to ensure alignment with evolving sustainability regulations such as the European CSRD. The CSRD requires companies to disclose "material" sustainability matters through a double materiality assessment, identifying issues significant to both the organization and its stakeholders [86]. This assessment shapes sustainability reporting, optimizes resource allocation for compliance, and informs company strategy. PWC defines the following seven-step process for the execution of a double materiality assessment [86]:

1. Identify and engage stakeholders.
2. Draw up a list of potentially relevant sustainability matters.
3. Define impacts, risks, and opportunities.
4. Assess impacts.
5. Assess financial opportunities and risks.
6. Draw up the materiality overview.
7. Strategic implications.

Understanding this double materiality approach is relevant, as CRAs often use materiality approaches to evaluate ESG risks in their credit ratings (see Section 4.3.4 to know more about materiality definitions for CRAs).

To address concerns that CRAs insufficiently incorporate ESG factors into their rating methodologies, S&P, the leading CRA, stated that "ESG factors are analysed at various points in ratings methodology" [85]. However, S&P acknowledged that ESG aspects are not routinely included in the assessment of the business risk profile [85]. While environmental and social risks are less explicitly accounted for, Moody's noted their indirect influence on the economic and institutional strength of rated countries in the case of sovereign credit ratings [13].

The emissions factor significantly impacts asset quality, as banks lending to mineral-related firms with higher emissions are more likely to encounter defaults [87]. Companies with elevated emissions levels often face stringent environmental regulations and compliance requirements, where failure to comply can lead to substantial fines, legal liabilities, or

even operational suspensions, straining financial resources and increasing default risk [87]. Moreover, high emissions typically reflect inefficient resource use, outdated technologies, or poor environmental management, resulting in elevated operational costs such as energy expenses, waste disposal fees, or emissions-related taxes, further pressuring profitability and cash flow [87]. Additionally, these firms are vulnerable to reputational risks due to growing public awareness of environmental issues. Negative publicity, consumer boycotts, and stakeholder backlash can erode market share and revenues, exacerbating financial strain and increasing the likelihood of default [87]. ESG factors and regulatory frameworks related to the energy transition are particularly significant for industries such as metals and mining, as well as oil and gas [70]. Some banks also have also started to create inside social credit ratings [70]. Regarding the incorporation of environmental risks, the EBA expresses a clear preference for integrating these risks into existing risk parameters rather than introducing separate environmental risk adjustment factors [83]. On March 30, 2020, ESMA introduced guidelines to standardize ESG disclosures, specifying how and when CRAs should include ESG considerations in their credit rating press releases [50]. The EBA emphasizes that environmental risk factors, including physical and transition risks, should not be treated as a distinct category of financial risk [83]. Instead, these factors could be considered as influential on traditional financial risk categories (such as a financial risk profile discussed in Section 4.2), with credit risk being particularly significant for banks' own funds requirements [83]. This would eventually lead to financial institutions needing to incorporate ESG risks in their models as well.

A critical question for the incoporation of ESG factors is whether ESG factors should be integrated into existing risk assessment frameworks or handled as a separate adjustment element. ESG factors appear to be particularly significant in evaluating downside risks to credit quality [77]. Empirical evidence shows that ESG considerations vary in their significance across different sectors and rating methodologies [77]. Kiesel & Lücke indicate that CRAs incorporate ESG factors into their rating decisions. However, the extent of their current integration remains limited [77].

Chapter 4

Results & Discussion

4.1 Selection of CRAs

The selection process for CRAs is guided by their relevance and alignment with the objectives of this study, which is determined by a selection of CRAs by ESMA and then a final selection procedure set up which can be found in Figure C.1 of Appendix C.1. A detailed overview of all the CRAs under ESMA is provided in the Table B.1 of Appendix B, which includes a distinction between solicited and unsolicited ratings as defined by the EBA [44]. This categorization ensures clarity regarding the rating methodologies and regulatory compliance of each CRA. A structured framework (see Figure C.1 of Appendix C.1) was employed to select specific CRAs from this list, ensuring that the chosen CRAs align with the objectives of this study. The framework considered several key criteria, including the inclusion of either a corporate or ESG methodology to support insights into the CRAs[1]. If this was not available, cross-sector methodologies could potentially be used to analyze the CRAs for their ESG incorporation.

This systematic approach ensured a comprehensive and representative selection of CRAs, providing a proper foundation for analysis. A detailed overview of all identified CRAs, including their classification based on the criteria, is provided in the Table 4.1. One can see that the final selection only includes CRAs that could be used both for solicited and unsolicited ratings.

Table 4.1: ECAIs and their regulatory use according to ESMA [53].

#	**ECAI**	**Abbreviation**[1]	**Regulatory Use**
1	S&P Global Ratings Europe Limited	S&P	Both solicited and unsolicited ratings
2	Moody's Investors Service	Moody's	Both solicited and unsolicited ratings
3	Fitch Ratings Ireland Limited	Fitch	Both solicited and unsolicited ratings
4	DBRS Rating GmbH	DBRS	Both solicited and unsolicited ratings
5	Scope Ratings GmbH	Scope	Both solicited and unsolicited ratings
6	EthiFinance Ratings	EthiFinance	Both solicited and unsolicited ratings
7	HR Ratings de México, S.A. de C.V.	HR	Both solicited and unsolicited ratings

[1] From now on, the abbreviations listed will be used to refer to the respective ECAIs.

[1]CRAs typically provide ESG documentation or corporate or cross-sector methodologies to disclose their approach to determining credit ratings. These documents are utilized and analyzed to gain insights into how CRAs incorporate ESG factors into their credit rating decisions. From the list in Table B.1, only those CRAs were selected that offered either an ESG-specific document for credit ratings, a corporate document addressing ESG incorporation, or a cross-sector document discussing ESG integration. This selection is illustrated in Figure C.1.

Table 4.1 provides an overview of the final CRAs chosen based on the framework of Figure C.1, focusing on their ESG integration in credit risk methodologies. The CRAs analyzed include S&P, Moody's, Fitch, DBRS, Scope, EthiFinance, and HR. These agencies represent diverse approaches and global coverage, offering insights into (ESG-driven) credit evaluations.

Before delving into the review of CRAs in Section 4.2, an overview of the CRA methodology disclosure landscape is presented, focusing on their most recent ESG disclosures. This overview serves to contextualize the recency of the analyzed documentation and assess whether it reflects the current regulatory framework or older guidelines. The comparison is summarized in Table 4.1.

Table 4.2: Comparison of ESG integration methodologies among CRAs. The documents highlighted in *italic* are defined as the documents that incorporate the most relevant ESG information. This document contains the most recent date for the respective CRA methodology document found.

CRA	**Public Frameworks Available**	**Documentation Used**	**Most Recent Found Date**	**Notes**
S&P	Yes	Corporate methodology [76], ESG documentation [75]	Dec 20, 2023	Republished multiple times to incorporate nonmaterial changes.
Moody's	Yes	Sector methodologies [88], *ESG documentation*	September 28, 2023	
Fitch	Yes	Corporate methodology [89], *ESG.RS documentation* [90]	January 7, 2019	It is still operational and has not been classified as outdated.
HR	Yes	Corporate methodology [91], *ESG documentation* [92]	February, 2024	
Scope	Yes	Corporate methodology [93], *ESG documentation*	February 28, 2024	Continuously updating these methodologies as understanding of ESG advances.
DBRS	Yes	Corporate methodology [94], *ESG documentation* [95]	August, 2024	Republished multiple times.
EthiFinance	Yes	*Corporate methodology* [96]	July, 2024	The document appears recent, which may seem unusual for a corporate rating document, typically expected to reflect established methodologies.

The additional information provided reveals that CRAs such as S&P, Moody's, and

Fitch (other CRAs too) offer detailed corporate or sector-specific methodologies alongside ESG documentation. Most CRAs have recently updated or are scheduled to update their methodologies, which shows an active effort to align their practices with evolving ESG standards. In contrast, Fitch's last update in 2019, while still operational, may raise questions about its alignment with current regulatory and market developments. Some CRAs, such as S&P and DBRS, stand out for republishing their methodologies multiple times to incorporate nonmaterial adjustments, putting focus on clarity and incremental refinement. Scope, on the other hand, is noted for its proactive approach to continuously updating its methodologies as ESG understanding advances, ensuring its framework remains relevant. EthiFinance's recent update is particularly notable, as corporate rating methodologies typically rely on established frameworks, suggesting this update may incorporate significant new insights or shifts in approach.

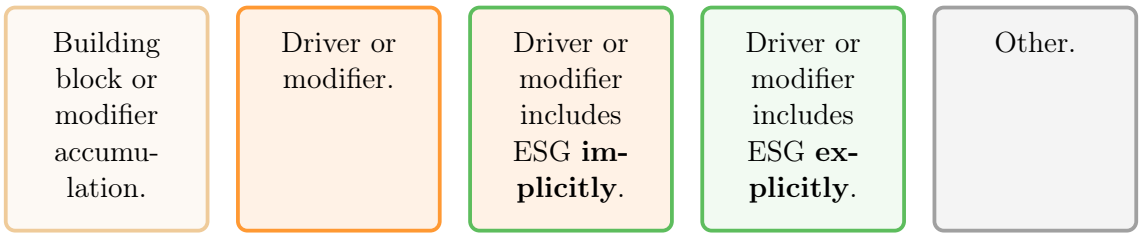
4.2 Reviewing CRAs

4.2.1 (Individual) Methodology Assessment of CRAs

This section provides an evaluation of selected CRA frameworks, based on the documentation reviewed in Table 4.1. From this analysis, it became evident that a recurring structure was employed across most CRAs, with many adopting similar approaches in organizing their methodologies. As highlighted in Section 3.2.2.1 of Chapter 3, the majority of these frameworks included business and financial profiles, which were often complemented by various modifiers. In this thesis, these profiles have been redefined as "building blocks" to allow flexibility for incorporating additional elements, should the respective CRA's methodology require it.

The objective was to categorize each building block within a standardized framework, ensuring consistency in how different factors, particularly those related to ESG considerations, affect credit ratings. This classification process was carried out by the author and is summarized in Appendix C. The findings from this analysis will form the baseline for the recommendations for the company, which will be discussed in Chapter 5.

This section will provide an overview of the key components and considerations used in the framework descriptions of the CRAs based on the performed literature assessment of all methodologies for the CRAs selected. The frameworks are visualized in a standardized approach and with a clear description. An example of such a framework is provided in Figure 4.1 for S&P Global Ratings Europe Limited in Section 4.2.1.1.



The different indicators represent various aspects of CRA's credit rating methodology and how ESG factors are considered. The first indicator, shown in beige, represents the accumulation of building blocks or modifiers that contribute to the overall rating, focusing on the core factors that do not explicitly involve ESG. The second indicator, in **orange**, refers to general drivers or modifiers that impact the rating without direct reference to ESG factors. These are more traditional elements, such as financial performance or operational efficiency, that influence credit assessment.

The **green** indicators introduce the role of ESG factors in the credit rating process. The green box around the orange box represents situations where ESG is considered implicitly. Here, environmental, social, or governance issues may indirectly affect the rating by influencing other broader factors, such as profitability or industry risk, but are not isolated as standalone criteria. In contrast, the actual green box represents the explicit inclusion of ESG factors. In these cases, specific environmental, social, or governance concerns are directly evaluated and have a clear impact on the credit rating.

Lastly, the **grey** indicator covers other considerations that do not fit the previous categories. These might include factors that are unique to a particular industry or non-ESG risks that could still play a significant role in determining the final credit rating. Together, these indicators help clarify how different drivers and factors, including ESG considerations, are integrated into the overall credit rating process.

4.2.1.1 S&P Global Ratings Europe Limited (S&P)

Figure 4.1 shows the framework used by S&P to determine credit ratings. To determine the assessment of a corporate issuer's business risk profile (BRP), the framework combines assessments of industry risk, country risk, and competitive position. The three analytic factors within the business risk profile generally are a blend of qualitative assessments and quantitative information [76]. The analysis then combines the corporate issuer's business risk profile assessment and its financial risk profile assessment through the usage of a table to determine its anchor. In general, the analysis weighs the business risk profile more heavily for investment grade anchors, while the financial risk profile carries more weight for speculative grade anchors [76].

After determining the anchor, additional factors are used to modify the anchor. Assessment of each factor can raise or lower the anchor by one or more notches or have no effect [76]. These conclusions take the form of assessments and descriptors for each factor that determine the number of notches to apply to the anchor. Another factor is a comparable rating analysis, which can raise or lower the anchor by one notch based on a holistic view of the company's credit characteristics [76].

The issuer credit rating (ICR) results from the combination of the stand-alone credit profile (SACP) and the framework, which determines the extent of the difference between the SACP and the ICR, if any, for group or government influence [76]. Extraordinary influence[2] is then captured in the ICR [76].

[2]The author defines, in the context of S&P's methodology, "extraordinary influence" to refer to external support or intervention that may affect a company's credit rating beyond what its standalone credit profile (SACP) would imply.

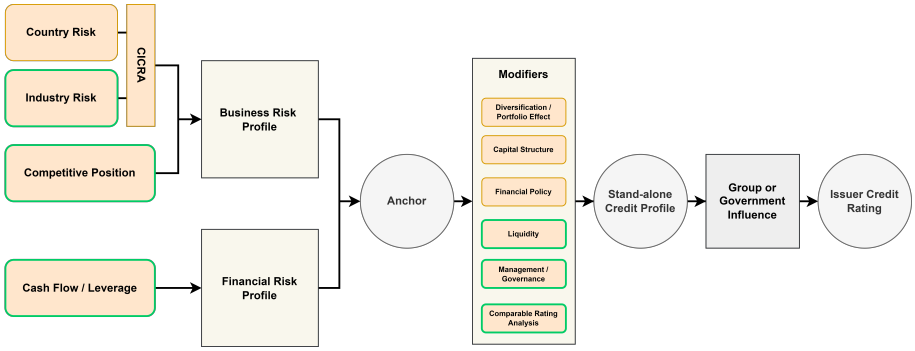


Figure 4.1: Overview of the methodology as described by S&P Global Ratings Europe Limited [75].

In the framework shown in Figure 4.1, the drivers and modifiers with a green outline indicate the components that are "most likely to include consideration of ESG" according to S&P's methodology [75]. This suggests that these drivers or modifiers have a higher likelihood of being affected by ESG factors within the credit assessment process. For more information, look into the *S&P's Corporate Methodology*[3].

4.2.1.2 Moody's Investors Service (Moody's)

Figure 4.2 illustrates *Moody's Corporate Methodology*[4], showing the structured process of deriving an assigned rating by integrating key financial and qualitative elements. The assessment begins with building blocks like scale, business profile (BP), profitability and efficiency, leverage and coverage, and financial policy, which provide insights into a company's operational and financial health [97]. Each of these components contributes to understanding aspects such as the company's market presence, stability of earnings, operational efficiency, debt levels, and the management's tolerance for financial risk [97].

These building blocks are analyzed within a scorecard framework, producing a preliminary score known as the score-indicated outcome [97]. This score reflects the company's credit profile based on quantitative factors, forming a baseline evaluation. Modifiers are then applied to refine this outcome. These modifiers adjust for qualitative elements that the scorecard alone may not capture, including judgment from the rating committee, broader cross-sector methodologies, and other considerations such as ESG factors, regulatory environment, and event risks [97]. The modifiers ensure that the rating reflects both the unique characteristics of the company and relevant external factors [97].

With both the scorecard outcome and adjustments from modifiers considered, Moody's arrives at an assigned rating [97]. This final rating reflects a comprehensive view of the company's creditworthiness, balancing quantitative analysis with expert judgment [97].

[3]The link offers a high-level introduction to S&P's use of methodologies for assigning credit ratings to corporate issuers [76].

[4]The link offers a high-level introduction to Moody's use of sector-specific methodologies for assigning credit ratings to corporate issuers [97].

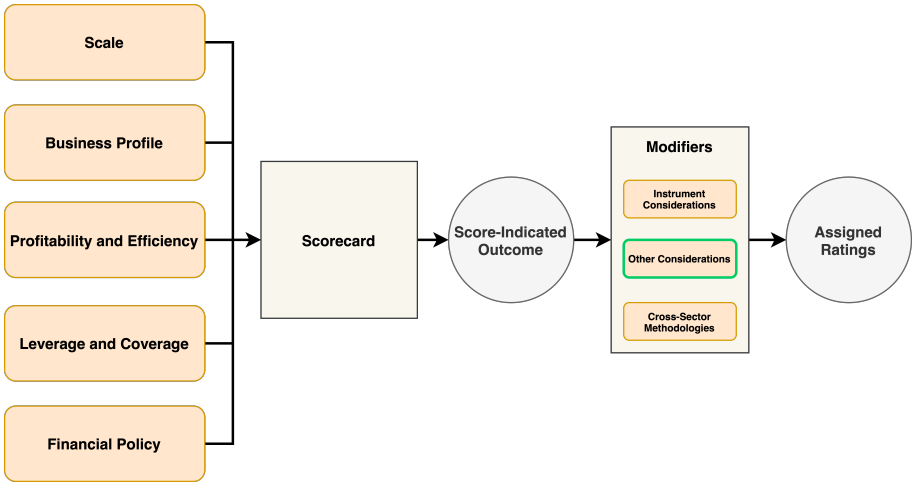


Figure 4.2: Overview of the methodology as described by Moody's Investors Service [97].

4.2.1.3 Fitch Ratings Ireland Limited (Fitch)

Fitch's Corporate Rating Criteria[5] provides an umbrella framework which guides the ratings for corporate issuers at the level at which the global diversity and dynamism of the corporate sector can be captured on a common basis [89]. Fitch's corporate rating framework, depicted in Figure 4.3, is structured through sector navigators (presented in *Fitch's Sector Navigators*[6]), which apply core rating concepts in a sector-specific context.

[5]The link offers a high-level introduction to Fitch's use of methodologies for assigning credit ratings to corporate issuers [97].

[6]The link offers a high-level introduction to Fitch's use of sector-navigator documents for assigning credit ratings to corporate issuers [98].

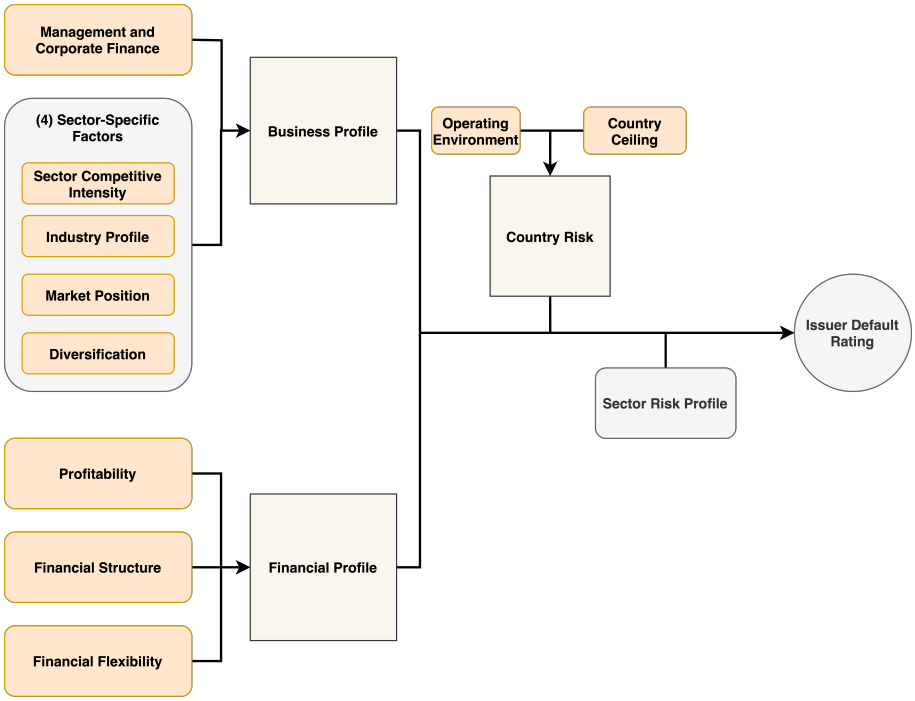


Figure 4.3: Overview of the methodology as described by Fitch Ratings Ireland Limited [98].

Each sector navigator consists of a sector-risk profile, an operating environment (OE) assessment, five business profile (BP) factors, and three financial profile (FP) factors. By capturing each key factor over a three-notch range, rather than a single notch, Fitch accommodates the qualitative nature of these factors, which vary widely across industries [89]. In Figure 4.3, the generic navigator is used as a baseline to show the framework [98]. This means that there is no individual assessment made for the various sector navigators[7].

Fitch's ratings reflect qualitative and quantitative factors encompassing the business and financial risks of issuers and their individual debt issues [89]. Projections are developed with a three- to five-year time horizon [89]. The weighting between individual and aggregate qualitative and quantitative factors varies between entities in a sector as well as over time. As a general guideline, where one factor is significantly weaker than others, this weakest element tends to attract a greater weight in the analysis [89].

As seen in Figure 4.3, Fitch Ratings does not have any green-colored boxes within its credit rating methodology, as can be seen in other CRAs. Instead, Fitch uses ESG relevance scores (ESG.RS) to assess the impact of ESG factors on a credit rating [90]. These scores identify the level of ESG-related risk or opportunity that may influence the final credit rating [90]. However, unlike some methodologies that specifically highlight or categorize individual building blocks, factors, or sub-factors related to ESG considerations, Fitch Ratings does not provide distinct visual markers or separate treatment of ESG elements within its overall methodology. ESG factors are integrated into the broader analytical framework, and their impact is reflected through the ESG.RS without isolating them in a standalone manner.

[7] 50+ sector navigators define sector-specific factors, sub-factors, financial ratios and related benchmark values [99].

4.2.1.4 DBRS Rating GmbH (DBRS)

DBRS employs a combination of a business risk assessment (BRA) and a financial risk assessment (FRA) to evaluate corporate credit ratings, as can be seen in Figure 4.4 [94]. The BRA captures the primary operational risks a company faces by analyzing various industry-specific BRA factors. Each factor is assessed and weighted, contributing to an overall BRA score that reflects the issuer's operational resilience and market position. The FRA focuses on the financial soundness of the company, examining critical financial metrics to evaluate the issuer's stability and debt-servicing capacity.

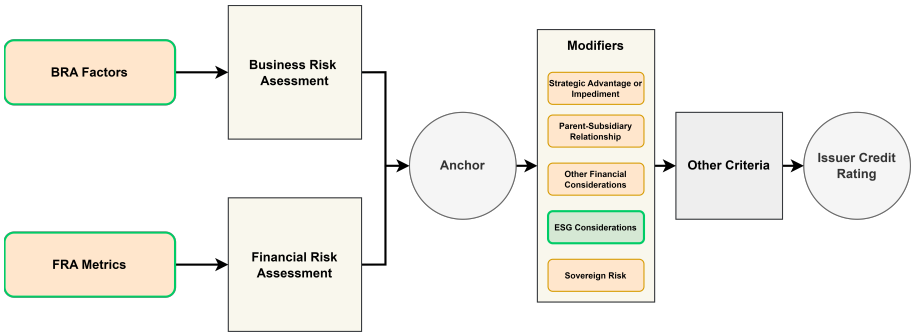


Figure 4.4: Overview of the methodology as described by DBRS Rating GmbH [95].

The anchor rating (or mentioned as the core assessment in *DBRS' General Corporate Methodology*[8], derived from both the BRA and FRA, is refined by applying overlay factors (modifiers) to adjust for unique considerations. The core assessment is a blend of the BRA and FRA. For most non-investment-grade issuers, the BRA and FRA are typically weighted equally [94]. For investment-grade issuers, the BRA will typically have greater weight than the FRA in determining the core assessment [94]. At the low end of the rating scale, however, particularly in the B range and below (within a range of typically AAA to CCC+ and below, see Table 3.1), the FRA and liquidity factors play a much larger role, and the BRA would, therefore, typically receive a lower weighting than it would at higher rating levels [94]. In addition, the volatility of a company's FRA is also taken into consideration in arriving at the final rating. A company with more volatile credit metrics than its industry peers may be rated lower than it would otherwise be, based on a blend of the BRA and FRA. The lower rating reflects the higher risk, especially in a downturn, associated with the increased volatility [94].

4.2.1.5 Scope Ratings GmbH (Scope)

Scope structures its corporate credit assessment through two main building blocks, the business risk profile (BRP) and the financial risk profile (FRP), each composed of several drivers that reflect an issuer's ability to manage industry challenges and financial obligations. The BRP examines an issuer's exposure to industry risk factors and competitive positioning [93].

The FRP evaluates an issuer's financial structure and resilience, focusing on metrics such as leverage, interest cover, and cash flow cover. These financial drivers provide a view of the issuer's capacity to handle debt obligations, with high leverage or weak cash

[8]The link offers a high-level introduction to DBRS's use of methodologies for assigning credit ratings to corporate issuers [94].

flow cover signaling increased credit risk. In FRP analysis, Scope also examines liquidity sources and debt structures, acknowledging that strong cash flows and favorable debt terms are crucial for financial stability. Together, these building blocks create a comprehensive assessment of creditworthiness, which Scope further adjusts based on ESG considerations and supplementary drivers [93].

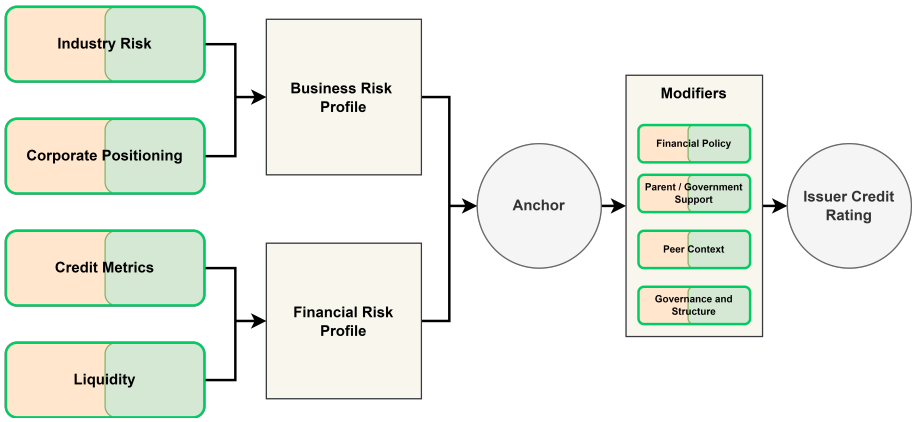


Figure 4.5: Overview of the methodology as described by Scope Ratings [57].

4.2.1.6 EthiFinance Ratings (EthiFinance)

EthiFinance evaluates corporate creditworthiness using a combination of a business profile (BP) and financial profile (FP), seen in Figure 4.6 (within the *EthiFinance Corporate Methodology*[9], this is called respectively) [96]. The rating process begins with an analysis of the BP, which accounts for industry risk, competitive position, and governance, each carrying significant weight in the overall business profile. According to EthiFinance, the BP reflects financial and extra-financial risk factors related to the industry in which a company operates, to its competitive positioning relative to its peers and to its governance and strategy [96]. The FP evaluates the amount of debt leverage and capitalisation both historically and prospectively [96]. Both of these building blocks will be discussed in Table C.16. Once the business and financial profiles are combined, modifiers are added. Modifiers such as liquidity, country risk, and ESG controversies are applied. Liquidity is assessed based on the firm's sources and uses of funds, such as operating cash flow, undrawn credit lines, and upcoming debt maturities. Additionally, ESG controversies are assessed to evaluate any financial, reputational, or legal impact on the company.

[9]The link offers a high-level introduction to EthiFinance's use of methodologies for assigning credit ratings to corporate issuers [96].

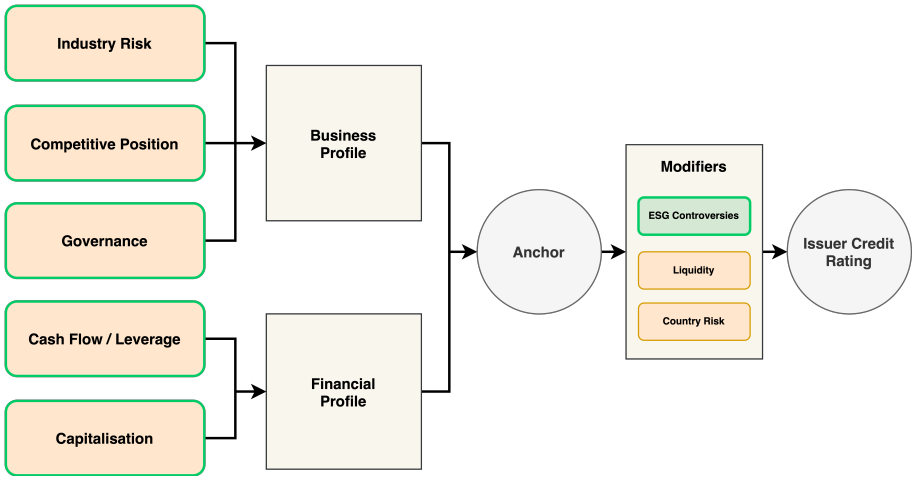


Figure 4.6: Overview of the methodology as described by EthiFinance Ratings [96].

4.2.1.7 HR Ratings de México, S.A. de C.V. (HR)

HR Ratings de Mexico evaluates corporate credit ratings using a combination of quantitative analysis and qualitative adjustments (general adjustments and ESG), as can be derived from Figure 4.7. This describes the process used by HR Ratings to evaluate the ability and willingness to meet corporate debt payment obligations. This process has two elements. The initial step involves examining the entity's financial performance (quantitative analysis) using four metrics. This is done over a rating period that typically spans one or two reported years and three or four projected years [91]. The approach is quantitative in nature. These years will be evaluated under a base and stress scenario [91]. In some cases, the time horizon considered will consist entirely of projected years. In a second step, qualitative adjustments can be applied to the rating obtained from the quantitative analysis. These adjustments could be general modifications or based on an assessment of ESG factors [91].

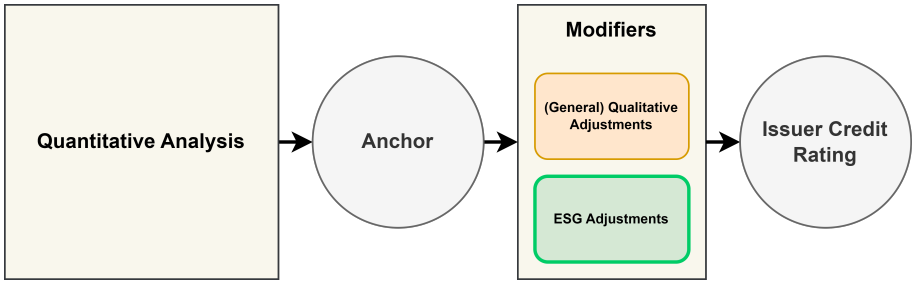


Figure 4.7: Overview of the methodology as described by HR Ratings de Mexico, S.A. de C.V. [92]

4.2.2 (Combined) Methodology Assessment of CRAs

After analyzing the individual methodologies of the various CRAs listed in Table 4.1, an overview has been created, summarizing their respective approaches. Table 4.3 shows the different approaches CRAs take for their incorporation of ESG within their respective credit rating methodology. This approach offers valuable insights into the key building blocks, drivers, and modifiers that should be considered when integrating ESG factors into

credit rating methodologies. The definitions of building blocks, drivers, and modifiers have been defined in Section 4.2.1.

Table 4.3: Methodologies by ECAIs and their respective ESG integration.

CRA	Integration ESG in Overall Framework	Building Blocks	Drivers	Modifiers	Other
S&P	Drivers, Modifiers		Industry Risk, Competitive Position, Cash Flow/Leverage[1]	Liquidity, Management and Governance, Comparable Rating Analysis[1]	
Moody's	Drivers, Modifier			Other Considerations[2]	
Fitch					ESG Relevance Score
DBRS		Drivers, Modifier	BRA Factors, FRA Metrics[3]	ESG Considerations	
Scope	Drivers, Modifier		Industry Risk, Corporate Positioning, Credit Metrics,[4] Liquidity		
EthiFinance	Building Block, Drivers, Modifier	Financial Risk Profile	Industry Risk, Competitive Position, Governance, Cashflow/leverage, Capitalisation	ESG Controversies	
HR	Modifier			ESG Adjustments	

[1] S&P states that all drivers and modifiers could be subject to ESG incorporation, but that the ones highlighted have the most realistic chance of having ESG integration.
[2] Within "Other Considerations", Moody's has an ESG subfactor called "ESG considerations" (see Table C.6).
[3] Other: Additional considerations not explicitly listed as drivers or modifiers.
[4] Credit metrics consist of: "Leverage", "Interest cover", "Cash flow cover".

Each building block, driver, and modifier defined in Table 4.3 may include various subfactors that provide further explaantions and insights into their evaluation. These subfactors are defined and explained in detail in the Appendix for the respective CRA (see Appendix C). Table 4.4 offers a comprehensive overview, guiding the reader to the detailed explanations of CRA methodologies. It includes references to both the tables detailing the building blocks and drivers and those defining the modifiers within a CRA's methodology.

Table 4.4: Overview of building block and/or driver and modifier table explanations per CRA.

CRA	**Building Block / Driver Table** / **Modifier Table**
S&P	Section C.2.1
Moody's	Section C.2.2
Fitch	Section C.2.3
DBRS	Section C.2.4
Scope	Section C.2.5
EthiFinance	Section C.2.6
HR	Section C.2.7

The integration of ESG factors by the assessed ECAIs reflects varying methodological approaches. S&P and DBRS incorporate ESG in drivers and modifiers, where S&P focuses on factors identified as "most likely to integrate ESG" into credit risk considerations [75]. Moody's combines qualitative and quantitative factors, utilizing forward-looking metrics and scenario analyses to integrate ESG considerations comprehensively, but only does this explicitly in its modifier section [88]. Fitch utilizes ESG relevance scores to enhance transparency, clarifying how ESG factors impact ratings without directly driving rating changes [90]. Scope ensures material ESG factors not captured in other overlays are addressed through an ESG-specific modifier, demonstrating a strategy to make ESG alterations in a later stage [93]. EthiFinance embeds ESG factors within the financial building block, rating drivers and modifiers, emphasizing their influence on FRPs and BRPs [96]. HR employs a qualitative approach to assess ESG factors, complementing their quantitative methodologies [91].

CRAs incorporate ESG risks into their rating methodologies by tailoring their considerations to the specific industry being assessed. Common ESG risks within a sector are reflected in the calibration of factors and sub-factors, ensuring their impact on metrics like demand, cash flows, and financial ratios is accounted for uniformly across issuers in that industry. To facilitate this, industries are categorized into distinct types, with subindustries further refining the classification [88]. ESG considerations could also be included by aligning with the unique characteristics of each category [91]. Given the variability of ESG risks across industries, geographies, and regulatory contexts, CRAs could also employ sector heatmaps (EthiFinance uses this approach) to adjust industry drivers based on environmental and stakeholder influences [96]. The heatmap provides a structured approach to integrating non-quantifiable ESG risks and opportunities into ratings, acknowledging

that their credit impact differs significantly between sectors. For example, industries with high exposure to regulatory changes or environmental dependencies might see a greater emphasis on these factors in their ratings.

The CRAs show some unique approaches to ESG integration that differentiate them in the market. Fitch stands out as the only CRA providing an ESG assessment that does not directly influence the credit rating but instead highlights where ESG factors could have impacted the rating through a "relevance score" approach for transparency [90]. HR Ratings takes a distinctive route by explicitly incorporating ESG factors via a modifier, ensuring a systematic evaluation of these considerations [92]. Scope uses a materiality matrix that compares the relative impact of ESG factors on business operations and sustainability [100]. EthiFinance is notable for its excellent ESG disclosure practices, effectively communicating how ESG factors influence their ratings through press releases and methodologies [96]. Similarly, DBRS provides clarity by using a flowchart to demonstrate how materialistic ESG factors are integrated into their framework, enhancing transparency [95]. Each methodology adds value to this evolving landscape of ESG integration in credit ratings by CRAs.

4.3 Evaluation of CRAs for ESG

4.3.1 ESG Considerations in CRAs

CRAs can provide a holistic evaluation of risks and opportunities, offering valuable insights into how organizations are positioned to tackle ESG challenges and look into emerging trends (see Table 4.5). This table will be leading in acquiring conclusions in general.

Looking at Table 4.5, the environmental (E) dimension, CRAs evaluate climate transition risks, physical environmental risks, and the impact of natural resource use. Key considerations include greenhouse gas emissions, energy and water management, biodiversity conservation, waste management, and the implementation of sustainable practices to mitigate environmental impacts. These elements help assess an entity's resilience to environmental challenges and regulatory compliance. This aligns closely with the challenges highlighted by the ECB, which served as an important factor for the eventual creation of the CSRD [63]. Social (S) considerations encompass factors such as labor relations, community engagement, health and safety, and human capital management. These include assessing workforce stability, diversity and inclusion, and the quality of stakeholder relationships, such as with customers and suppliers. These elements reflect an organization's ability to manage its social responsibilities while maintaining operational efficiency and reputation. Governance (G) factors address the structural and procedural aspects of an organization's management and oversight. Key aspects include board structure and independence, transparency in reporting, risk management frameworks, and ethical business practices. Effective governance ensures accountability and builds trust with stakeholders, which are critical to long-term financial stability and creditworthiness.

Table 4.5: ESG factors categorized by E, S, and G criteria for each CRA [75] [88] [90] [95] [100] [96] [92].

CRA	Environmental (E)	Social (S)	Governance (G)

S&P	1) Climate transition risks 2) Physical risks 3) Natural capital 4) Waste and pollution 5) Other environmental factors	1) Health and safety 2) Social capital 3) Human capital 4) Other social factors	1) Governance structure 2) Risk management 3) Transparency and reporting 4) Other governance factors
Moody's	1) Carbon transition 2) Physical climate risks 3) Water management 4) Waste and pollution 5) Natural capital	1) Customer relations 2) Human capital 3) Demographic trends 4) Health and safety 5) Responsible production	1) Financial strategy 2) Management credibility 3) Organizational structure 4) Compliance and reporting 5) Board structure
Fitch	1) GHG emissions 2) Energy management 3) Water and wastewater 4) Waste and hazardous materials 5) Environmental impacts	1) Human rights 2) Customer welfare 3) Labor relations 4) Employee wellbeing 5) Social impacts	1) Management strategy 2) Governance structure 3) Group structure 4) Financial transparency
DBRS	1) Emissions, effluents, and waste 2) Carbon and greenhouse gases 3) Resource management 4) Biodiversity 5) Climate risks	1) Social impact of products 2) Human capital 3) Product governance 4) Data privacy 5) Occupational safety	1) Bribery and corruption 2) Business ethics 3) Transaction governance
Scope	1) Resource management 2) Product innovation 3) Physical risks 4) Production efficiencies	1) Labor management 2) Health and safety 3) Client relationships 4) Reputational risks	1) Company control 2) Transparency 3) Corporate structure 4) Stakeholder management
EthiFinance	1) Climate 2) Resources 3) Pollution 4) Biodiversity	1) Suppliers 2) Consumers 3) Communities	1) Environmental management system 2) Board independence 3) ESG issue prioritization 4) Role separation of CEO and Chair

HR	1) Corporate policies and environmental approach 2) Exposure to natural phenomena 3) Environmental regulations 4) Contingency plans for climate change 5) Long-term sustainability policies	1) Social business approach 2) Human capital 3) Talent retention 4) Inclusiveness policies 5) Corporate reputation	1) Internal regulations 2) Quality of senior management 3) Operational risks 4) Transparency 5) Non-compliance history

With an overview of the potential ESG risks identified for each CRA, these risks can now be linked to the upcoming CSRD. To achieve this, the identified ESG risks should be categorized according to the classifications outlined in the ESRS (refer to Table 3.3 in Section 3.3.3).

Table 4.6 provides an analysis of the integration of ESG factors in credit rating methodologies used by various CRAs, as aligned with the European Commission's CSRD requirements and ESRS (see Table 3.3). Each CRA's methodology is examined to determine whether it incorporates specific ESG topics, grouped by category. The topics covered reflect key ESG areas such as climate change, biodiversity, resource use, and workforce considerations. Checkmarks (✓) indicate that the CRA integrates the respective topic within its rating criteria, while crosses (✗) signify that the topic is not included. This comparison helps highlight the degree of ESG integration across different agencies, offering insights into how comprehensively each CRA assesses sustainability factors in their ratings.

Table 4.6: Analysis of ESG integration in CRA methodologies based on CSRD and ordered based on the market share calculation by ESMA [50].

Category	Topic	S&P	Moody's	Fitch	DBRS	Scope	EthiFinance	HR
E	Climate change	✓	✓	✓	✓	✓	✓	✓
E	Pollution	✓	✓	✓	✓	✗	✓	✗
E	Water and marine resources	✗	✓	✓	✗	✗	✗	✗
E	Biodiversity and ecosystems	✓	✓	✓	✓	✓	✓	✗
E	Resource use and circular economy	✗	✓	✓	✓	✓	✓	✗
S	Own workforce	✓	✓	✓	✓	✓	✓	✓
S	Workers in the value chain	✗	✓	✓	✗	✗	✗	✗
S	Affected communities	✓	✓	✓	✓	✓	✓	✓
S	Consumers and end-users	✓	✓	✓	✓	✓	✗	✗
G	Business conduct	✓	✓	✓	✓	✓	✓	✓

Table 4.6 reveals the extent of selected CRAs to integrate ESG factors into their methodologies, based on the CSRD. Climate change is universally addressed across all CRAs, reflecting a strong emphasis on transition and physical risks. Pollution is another well-covered area, with S&P, Moody's, Fitch, DBRS, and EthiFinance explicitly incorporating risks and associated costs, while HR and Scope show limited focus. Water and marine resources remain underrepresented, with only Moody's and Fitch addressing these factors in their analyses. Biodiversity and ecosystems receive moderate attention, with most CRAs except HR integrating these risks into their frameworks.

In resource use and the circular economy, Moody's, Fitch, DBRS, Scope, and EthiFinance discuss aspects such as efficiency improvements and waste reduction, whereas S&P and HR Ratings are less detailed. Social considerations, particularly concerning the

own workforce and affected communities, are included across all CRAs. However, only Moody's and Fitch give attention to workers in the value chain, highlighting risks in labor practices and supply chains. Consumers and end-users are addressed by S&P, Moody's, Fitch, DBRS, and Scope, indicating growing attention to product safety, societal impacts, and governance. Governance factors are consistently incorporated across all CRAs, with a focus on business conduct, regulatory compliance, and corporate leadership. This sounds logical, as all governance-related factors must be assigned to one specific category, with business conduct serving as a particularly broad classification. While governance, climate change, and workforce considerations are thoroughly integrated, the limited treatment of topics such as water resources and value chain impacts underscores potential areas for improvement in ESG analysis methodologies.

4.3.2 ESG Factors: Industry Considerations

Table 4.7: Industry considerations by CRAs.

CRA	**Industry Considerations**	**Additional Comments**
S&P	Yes	ESG risks are evaluated by industry, geography, and entity. Industries with high climate transition risks (e.g., fossil fuels, transportation) or higher exposure to physical risks (e.g., extreme weather) are analyzed. Companies' risk mitigation measures, such as investing in resilient infrastructure, are also considered.
Moody's	Yes	ESG risks are reflected in sector-specific methodologies. For instance, oil refiners face carbon transition risks, while within the sector, variations occur based on jurisdictional regulations or successful risk mitigation strategies. Social risks and stakeholder reactions are also sector-dependent.
Fitch	Yes	Fitch incorporates four sector-specific drivers within its methodology, each of which introduces unique ESG considerations. These drivers are analyzed differently for each sector, with distinct factors being considered for each one.
DBRS	Yes	Industries like oil and gas, mining, airlines, and consumer products are particularly vulnerable to environmental and social risks. Remediation costs, carbon offsets, and litigation costs can significantly impact financial performance and ratings.
Scope	Yes	ESG relevance depends on asset class, industry, and region. Scope's methodologies are tailored to these factors and regularly updated to reflect best practices and regulatory developments. Stakeholder interaction helps align credit assessments with industry trends.

EthiFinance	Yes	Uses a sector heatmap to differentiate financial and non-financial impacts. Sectors like oil and gas face risks, while renewable energy sectors benefit from ESG trends. Environmental and stakeholder issues are key considerations in the heatmap.
HR	Yes	ESG risks vary by industry. Analysis focuses on materiality, such as resource dependency, waste generation, and exposure to clean alternatives. Strategies for resource management, recycling, and environmental policies are considered in sector evaluations.

4.3.3 ESG Factors: Identified Costs

Many CRAs incorporate ESG factors through some sort of financial profile or statements, emphasizing the importance of identifying associated costs that are associated with ESG risks. This approach helps materialize ESG issues by directly linking them to financial impacts, enabling a more clear (or quantitative) integration of ESG considerations into credit assessments.

The analysis of ESG risks and costs, which is shown in Table 4.8, reveals both similarities and differences among the assessed CRAs. While all CRAs recognize the importance of ESG factors, they vary significantly in their focus for cost attributions, showing diverse priorities and areas of concern. Many CRAs tend to agree on the significance of climate-related factors, such as carbon emissions and the transition to a low-carbon economy, as drivers of costs [75]. Table 4.8 highlights the global impact of regulatory changes and environmental risks on corporate operations, where almost all CRAs implement some type of regulatory costs. Regulatory compliance costs, capital investments for adaptation, and risks associated with stranded assets emerge as recurring themes across CRAs, which shows a common acknowledgment by CRAs of the financial pressures corporates face in addressing climate change.

Despite these similarities, the CRAs also vary in their approaches. For instance, S&P emphasizes governance deficiencies and profitability concerns, reflecting a more comprehensive integration of operational and financial impacts. Moody's, on the other hand, places focus on labor issues, such as rising costs and productivity losses due to strikes, showing that it takes social governance within workforce management into account [88]. Meanwhile, EthiFinance's attention to waste and water management costs highlights sustainable resource utilization and operational efficiency [96]. The differences are further evident in the attribution of costs. Some CRAs, like DBRS, emphasize the physical risks of climate change and the need for adaptation, while Scope focuses on production efficiency and health and safety, tying reinvestment needs to operational upgrades. HR uniquely frames ESG adaptation as leading to a permanent increase in operational expenses, suggesting a structural shift in cost dynamics [92].

Table 4.8: An overview of the costs and ESG risk factors for each assessed CRA.

CRA	ESG Factors Mentioned	Identified Costs
S&P	Carbon emissions, pollution, regulatory stringency, governance deficiencies, transition to low-carbon economy	Pollution fines, regulatory compliance costs, reduced investment values in carbon-heavy sectors, weaker profitability, higher barriers to entry

CRA	ESG Factors Mentioned	Identified Costs
Moody's	Product safety, carbon transition, environmental hazards, regulatory pressures, labor issues	Capital investment needs, litigation costs, increased regulatory compliance costs, loss of productivity due to strikes, rising labor costs
DBRS	Physical climate change, transition to low-carbon economy, social and governance factors	Adaptation costs, transformation costs, litigation costs, increased labor costs, productivity risks, remediation costs
Scope	Carbon pricing mechanisms, resource management, production efficiency, health and safety, labor management	Compliance costs, stranded asset risks, reinvestment needs, operational costs from climate risks, costs for production upgrades
EthiFinance	Climate risk, environmental regulation, corporate ESG mismanagement	Operating costs, stranded assets, investment for regulatory compliance, energy consumption, waste and water management costs
HR	Environmental impact mitigation, ESG regulations, risk mitigation	Costs for operational adaptation, investment in technology, extraordinary expenditures, permanent increase in current expenditure

The variations in methodologies suggest that banks must navigate these assessments carefully. A carbon-intensive company may prioritize addressing risks identified by S&P and DBRS, while firms with significant workforce challenges might align more closely with Moody's perspective. Similarly, companies aiming to enhance resource management and internal governance may find EthiFinance's framework particularly relevant. The costs are combined and categorized into three main groups: environmental (E), social (S), and governance (G) costs. The general assesed environmental costs include:

- ◇ *Carbon pricing costs*, which includes expenses such as carbon taxes, greenhouse gas (GHG) offset costs, and compliance costs.
- ◇ *Waste and pollution costs*, which handles transition compliance costs, clean-up efforts, and remediation for physical risks.
- ◇ *Physical climate change costs*, which are costs related to value loss (e.g., inventory loss), damage from extreme weather, and climate adaptation measures.
- ◇ *Water and energy consumption costs*, incorporating operational expenses linked to resource usage.
- ◇ *Regulatory compliance costs*, which describe costs for adhering to environmental laws, including certifications (e.g., ISO 14001), fines, and penalties.
- ◇ *Transition costs for low-GHG operations.* These are investments in green technologies and transformation costs.
- ◇ *Stranded asset risks*, meaning a reduction in asset value due to carbon-intensive investments becoming obsolete.

Social costs that could be generally found across the CRAs include:

- ◇ *Health and safety costs*, which include training expenses for safety compliance and accident-related costs.

- ◇ *Labor costs*, which cover wages, benefits, and employee retention efforts.
- ◇ *Turnover costs*, which describe expenses linked to permanent employee departures.
- ◇ *Loss of productivity*, resulting from strikes or hostile work environments.
- ◇ *Litigation costs*, related to disputes over social factors or changes in consumer behavior.
- ◇ *Consumer behavior impact costs*, reflecting sales effects due to societal trends or preferences.

Governance costs, which were found across the different CRAs, include:

- ◇ *Regulatory compliance costs*, which include expenses for implementing quality management systems (e.g., ISO 9001) or anti-corruption measures.
- ◇ *Fines and penalties*, referring to expenses resulting from governance failures, legal actions, or regulatory violations.
- ◇ *Public disclosure and reporting costs*, which cover costs related to implementing business codes of conduct or ESG disclosures.
- ◇ *Governance inefficiencies*, including challenges such as conflicts of interest or complexities in ownership structures.

4.3.4 ESG Factors: Materialities & Time Horizons

In this section, CRAs that define an approach for the materiality of ESG risks will be discussed, as well as the time horizons they incorporate when assessing these risks. While traditional financial metrics typically focus on short-term impacts, ESG risks are often long-term in nature and require a different lens for evaluation [75]. Therefore, the approach to assessing the materiality of ESG risks may differ significantly from financial metrics. The thresholds used by CRAs to classify ESG risks as material, as well as the time horizons considered for such risks, are crucial to understanding how these factors are integrated into overall credit ratings. This section will provide a comparison of the methodologies used by various CRAs to identify and incorporate material ESG risks, shedding light on how they reconcile short-term financial outlooks with the inherently long-term nature of ESG factors. Ultimately, this will contribute to the broader conclusion of how ESG risks are recognized, materialized, and projected over time in credit rating practices.

Table 4.9: An overview of how CRAs assess ESG materiality, including key principles and processes.

CRA	Dynamic Evaluation Process	Qualitative Judgement Involved	Additional Comments

S&P	Incorporates forward-looking analysis with dynamic evaluation	Yes	Evaluates ESG credit factors based on current visibility and materiality. Dynamic thresholds shift over time as uncertainties regarding factors like climate risks, policies, or technology evolution become clearer. Material impacts may be factored into qualitative considerations beyond financial forecasts, e.g., industry-level risk assessments.
Moody's	Combines qualitative and quantitative analysis for credit impact	Yes	Considers both standalone and interplay effects of ESG factors. ESG risks and opportunities are evaluated in relation to their impact on cash flows, liquidity, and asset value. Visibility into future cash flows is essential; qualitative judgment is applied when standard data is insufficient, especially where ESG risks extend beyond the measurable forecast period.
Fitch	Assessed dynamically through ESG Relevance Scores (ESG.RS)	Yes	ESG scores measure the relative materiality of ESG risks to credit ratings. They are updated dynamically to reflect changes in the relevance of ESG factors across sectors and issuers.
DBRS	Incorporates ESG analysis in financial projections	Yes	Focuses on regulatory drivers and transparency to assess ESG materiality. ESG risks are factored into revenue, cash flows, and refinancing abilities. Acknowledges the evolving nature of data consistency and disclosure standards.
Scope	Conducts double materiality assessments	Yes	Uses sector-specific materiality matrices to measure ESG impacts, balancing business and financial risk against sustainability impact. This differentiates how ESG factors influence both credit profiles and broader sustainability outcomes.

EthiFinance	Double materiality approach at sector and company levels	Yes	Aligns with EU definitions of financial and sustainability materiality. Evaluates both how ESG factors affect companies (financial risk) and how companies impact stakeholders and the environment (sustainability risk).
HR	Evaluates ESG impact on risk exposure and adaptation	Yes	Uses a label system (Superior, Average, Limited) to identify material risks and assess an entity's adaptation capabilities. The process combines qualitative assessments with quantitative projections for mid- or long-term ESG impacts. Risks may shift as societal trends and governance standards evolve.

Table 4.9 provides a detailed comparison of how different CRAs assess the materiality of ESG risks. Each CRA adopts a process to assess the relevance of ESG risks to credit ratings, also looking into dynamic evaluation of these risks (explicitly mentioned in the documentation for the cases of S&P and Fitch, but is expected to be done by other CRAs as well) [75] [90]. This shows the recognition by CRAs that ESG risks are not static and can evolve over time, requiring CRAs to adjust their methodologies accordingly over time as well.

Main findings across all the CRAs are the incorporation of forward-looking analysis, the usage of qualitative judgement in all cases, and double materiality approaches. For example, S&P uses dynamic thresholds that shift as uncertainties around climate risks, policies, or technological developments become clearer [75]. Moody's takes a hybrid approach, combining both qualitative and quantitative analyses to understand how ESG risks can affect cash flows, liquidity, and asset values, with a particular focus on ESG risks that extend beyond the measurable forecast period [88]. Fitch uses ESG Relevance Scores (ESG.RS) to dynamically assess the materiality of ESG risks for different sectors and issuers, highlighting the importance of ESG factors in shaping future credit profiles [90].

Qualitative judgment, as mentioned, also plays a significant role when data or forecasts are insufficient. This is evident in Moody's approach, where subjective evaluation is used to assess the impact of ESG factors, especially when ESG risks may not yet be fully visible in financial forecasts [88]. HR takes a similar approach by using a label system (Superior, Average, Limited) to assess material risks and adaptation capabilities, combining qualitative assessments with quantitative projections for mid- or long-term ESG impacts [92].

The concept of double materiality is also central to some CRAs, such as Scope and EthiFinance [100] [96]. Scope's use of sector-specific materiality matrices provides a differentiated approach to measuring ESG impacts, balancing business and financial risks against broader sustainability outcomes [100]. EthiFinance, aligning with EU definitions, evaluates both financial risk and how companies impact stakeholders and the environment, emphasizing a holistic approach to ESG risk assessment [96]. DBRS acknowledges the challenges of inconsistent data and evolving disclosure standards, emphasizing the need for transparency and the influence of regulatory drivers [95]. This reflects the growing im-

portance of ESG disclosures in shaping how CRAs evaluate materiality, particularly as companies adapt to new regulations and sustainability standards.

Table 4.10: Incorporation of ESG Time Horizons by CRAs. Note: For Fitch, no information could be found during the construction of this table.

CRA	**Time Horizons Incorporated**	**ESG Incorporation Based on Time Horizons**
S&P	Long-term issuer credit ratings have no predetermined horizon. Financial forecasts focus on near to medium-term factors (e.g., revenues, refinancing costs) where uncertainty is lower. Longer-term risks, such as technological or climate-related events, are monitored but not always quantified due to timing uncertainties.	ESG credit factors are incorporated when sufficiently visible. Nearer-term risks, like carbon emission taxes, are included in forecasts, while risks outside forecast horizons are factored into qualitative assessments, such as industry-level risk and competitive position analysis.
Moody's	Incorporates both short and long-term risks but emphasizes nearer-term risks with clearer visibility. Long-term risks, such as climate change or demographic trends, are analyzed for broad or issuer-specific impacts.	Long-term risks are often diffuse, uncertain, or mitigable through adaptation (e.g., cost reduction, technology shifts). Broad risks (sector-wide) and event risks (e.g., natural disasters) are assessed, with qualitative judgments applied where data and visibility are limited. Fundamental credit strengths provide resilience against both short and long-term ESG risks.
Fitch	No specific information provided.	No specific information provided.
DBRS	Considers ESG risks across the life of the rating, whether issuer-specific or transaction-based. Longer time horizons factor in risks that shorter-duration ratings may exclude.	Transaction-specific ratings incorporate risks that may occur over extended horizons (e.g., 30 years). This contrasts with issuer ratings, where short-term risks tend to have higher significance. ESG factors are integrated into financial profiles, including cash flows and refinancing ability.

Scope	Incorporates time horizons dynamically, considering the interplay of ESG factors and credit fundamentals.	ESG factors can amplify, offset, or limit credit risks. The lack of standardized data is an obstacle, though initiatives like the EU's Corporate Sustainability Reporting Directive (CSRD) and European Sustainability Reporting Standards (ESRS) are improving transparency. Scope aligns with the EU's double materiality principle, assessing both financial impact and sustainability.
EthiFinance	Evaluates ESG risks based on short-term (<3 years) severe exposures and short to medium-term (3–5 years) for less immediate risks. Industry drivers are assessed over a 5-year horizon.	Considers the financial materiality of ESG risks on a company level and the broader sustainability impacts on stakeholders and the environment, aligning with the double materiality approach.
HR	Assesses ESG risks using historical data (2 years) and projected scenarios (3–5 years). Real estate companies may use extended horizons (up to 7 years).	ESG risks are incorporated through quantitative and qualitative assessments. Adjustments to ratings can occur through ESG-specific qualitative notches, reflecting risks and adaptation capabilities. Labels (Superior, Average, Limited) help determine materiality and resilience over time.

Table 4.10 outlines the approach taken by different CRAs to incorporate ESG time horizons into their assessments. The way each CRA handles time horizons in relation to ESG risks highlights different perspectives by the selected CRAs how short- and long-term factors are weighed in credit ratings.

Each CRA, shown in in Table 4.10, has its own method of evaluating ESG risks across time horizons. For example, S&P focuses primarily on near to medium-term factors like revenues and refinancing costs, where uncertainties are more manageable [75]. However, it also monitors long-term risks, such as those related to climate change and technological developments, but does not always quantify them due to uncertainties in their timing[10]. In contrast, Moody's incorporates both short- and long-term risks, but also with an emphasis on near-term factors that are easier to predict and adapt to, like carbon transition risks [88]. Long-term risks, such as climate change, are considered but are typically seen as more uncertain [88].

DBRS takes a broad view, considering ESG risks over the entire life of the rating [95]. This allows it to account for longer-term risks in transaction-based ratings that may span multiple decades. Similarly, Scope incorporates dynamic time horizons that take into account the evolving interplay between ESG factors and credit fundamentals, acknowledging that ESG risks can either amplify or mitigate credit risks [100]. EthiFinance and HR both assess ESG risks within specific time frames, with EthiFinance focusing on short-term

[10]This is related to S&P's "principle system", where Principle 1 states: "Our long-term issuer credit ratings do not have a predetermined time horizon" [75]. These principles are a good baseline for people to look into for ESG in credit.

and medium-term risks and HR considering historical data and projections ranging from 3 to 5 years, and extending to 7 years for some sectors like real estate (also medium-term assessments) [96] [92].

When it comes to incorporating ESG factors based on time horizons, CRAs vary in how they handle the materiality of risks. S&P includes ESG risks that are sufficiently visible, particularly those in the near-term, such as carbon emission taxes, while relying on qualitative assessments for longer-term risks, like climate change, that fall outside their forecast horizons [75]. Moody's applies both quantitative and qualitative judgment, focusing on how ESG risks might affect cash flows, liquidity, and asset values in the near term. Longer-term ESG risks are considered but tend to be more uncertain, so they are assessed using broader qualitative judgments. DBRS incorporates ESG risks into financial profiles, particularly for transactions that may last decades, such as in infrastructure projects or real estate. Scope aligns with the EU's double materiality principle, considering both the financial impact and broader sustainability aspects of ESG risks, with a focus on transparency and standardized data, which is improving over time due to regulations like the EU's CSRD.

The way CRAs approach materiality in relation to time horizons reflects the different ways they assess the potential impact of ESG risks. Agencies that take a longer-term view, such as DBRS, Scope, and EthiFinance, are better positioned to consider the broader ESG risks that may materialize in the future. Shorter-term-focused agencies, like S&P and Moody's, try to lay focus on integrating more immediate risks into their forecasts while still accounting for longer-term factors in a qualitative manner (could be through modifiers).

4.3.5 Tackling EBA Challenges with CRA Insights

The EBA has identified several challenges in measuring ESG risks in their documentation[11] [63]. These challenges highlight the difficulties in incorporating ESG factors into financial models and credit risk assessments. Although the list is not exhaustive, the following challenges have been frequently observed, and the EBA continues to focus on resolving them to improve the consistency and reliability of ESG risk evaluations across the banking sector [63].

Limited availability of high-quality, granular data: Reliable and consistent environmental data, such as scientific metrics or exposure-specific characteristics, are often inaccessible [63]. This complicates risk classification and analysis. While current disclosure initiatives aim to enhance data quality and availability, substantial gaps remain [63].

CRAs often use country or sector-level data when granular company-level data is unavailable (like sector heatmaps by EthiFinance or Fitch), which can act as an interim solution. Some CRAs emphasize enhanced disclosure requirements for companies, encouraging standardized and consistent ESG reporting to improve data availability [95]. CRAs incorporate both qualitative analysis alongside quantitative data to bridge gaps caused by limited specific data.

Absence of standardized classification systems: Definitions of green, neutral, or environmentally harmful activities are different across exposure types and jurisdictions [63]. Existing systems are often binary, limiting their use for nuanced risk differentiation. Firms with credible transition plans differ significantly in risk from those continuing harmful activities [63].

[11] To see the documentation called "On the role of environmental and social risks in the prudential framework", visit this link.

CRAs analyze transition strategies of companies, looking differently into firms pursuing harmful activities but with credible plans to transition to greener operations [75]. CRAs emphasize sector-specific classifications to account for differences in risk across industries, ensuring a more accurate classification system.

Cost barriers for physical risk data and financial translation: Assessing physical risks requires granular data on collateral measures, insurance, and counterparty soundness [63]. However, current proxies are often country-level estimates, and obtaining granular data is costly. Translating physical risks into financial impacts remains uncertain due to the unpredictability of acute events [63].

Similar to CRAs, IRB modellers can incorporate qualitative risk overlays for firms with limited physical risk data. This includes assessing mitigation plans, insurance coverage, and adaptation strategies, which are often embedded in CRA methodologies (see Section 4.3.1). Leveraging CRA sector-specific physical risk insights can improve risk differentiation within IRB models. Firms in high-risk sectors (e.g., real estate near flood zones) can be classified and treated differently in capital requirement calculations.

Issues with ESG ratings and scores: ESG ratings often suffer from inconsistent quality, limited scope, and non-transparent methodologies [63]. Efforts by regulators like ESMA aim to improve their reliability and comparability through greater oversight of rating providers [63].

This issue is not directly related to credit risk assessments, as it relates more to the overall transparency of ESG ratings, while this thesis focuses on ESG integration in credit.

Complexity in risk analysis: Varying classifications of green and harmful activities across exposure classes complicate analysis. Forward-looking indicators, crucial for accurate assessments, are particularly difficult to standardize and implement [63].

CRAs use forward-looking scenarios to evaluate transition risks and physical risks, accounting for evolving regulatory and climate pathways. Risk analysis frameworks from CRAs incorporate multiple (but different) time horizons (short, medium, and long-term are all seen, as found in Section 4.3.4), providing a dynamic view of ESG risks. CRAs develop driver-based models that break ESG risks into sub-factors and indicators to simplify analyses (e.g., climate commitments, financial resilience). By integrating qualitative expert judgment with quantitative data, CRA's methodologies could try to balance complexity and usability in risk assessments.

Chapter 5

Integration into IRB Modeling: Recommendations

Integrating ESG factors into IRB models is increasingly essential for banks aiming to enhance their risk assessment frameworks in line with evolving regulatory expectations and stakeholder demands. How ESG considerations can be embedded into IRB models for banks and how they may influence credit ratings is important to assess and can be done by drawing upon methodologies utilized by CRAs. Based on this analysis, the study provides recommendations, serving as heuristics, for incorporating ESG factors into IRB models, offering flexibility for banks like ING to select approaches that best suit their needs. These recommendations align with practices adopted by at least one CRA, suggesting conformity with regulatory standards.

A systematic, step-by-step integration of ESG factors into IRB models allows banks to gradually assess the impact of these factors on credit ratings. By mapping ESG risks to relevant components within the IRB framework, such as building blocks, drivers, and modifiers[1], banks can effectively capture the effects of ESG risk factors. The method tries to mirror the approaches taken by CRAs, facilitating a better alignment with industry practices that are being used within the SA to assess credit risk. Based on Table C.22, this study outlines recommendations for banks by linking costs, materiality, and time horizons associated with CSRD to ESG risks mapped to the ESRS structure. To further elaborate on these recommendations, fictional examples could be developed, leveraging insights from CRA methodologies, to demonstrate how each ESRS category might be integrated into an IRB model. This is done below, where all the various recommendations are applied in a fictional example for the respective CSRD factor.

This thesis aims to structure the approach for those looking to apply the information gathered in Chapter 4. Therefore, a framework is proposed that is based on all the aspects identified from reading the methodology disclosures of CRAs. This framework provides a clear pathway for integrating ESG factors into IRB models and ensures that banks can address the important components effectively. Based on these methodologies, points that should be addressed when integrating ESG include industry considerations, materialization, and time horizons. These elements serve as foundational considerations for banks to ensure their ESG integration is aligned with current practices and regulatory standards.

[1]CRAs incorporate ESG factors into their credit rating methodologies in various ways, typically influencing the assessment through building blocks, drivers, and modifiers. By understanding these approaches, banks can adapt their IRB models to account for ESG factors that may affect borrowers' creditworthiness.

5.1 Framework

In this section, a framework is proposed for (IRB) risk modelers to systematically integrate ESG factors into their internal models and help them in making the correct approach to handling the risk (from Section 4.2, one can see this could be either via a driver or modifier). This framework is based on the variables identified in Chapter 4, which include industry, materiality, time horizon, and costs associated with specific ESG risks. These variables serve as the main components that need to be considered when assessing ESG risks in the context of credit ratings for risk modeling. The framework is designed to guide banks in incorporating ESG considerations into their risk models in a consistent and effective way. By considering these variables mentioned, banks can ensure that ESG risks are fully accounted for when assessing creditworthiness. The framework offers flexibility, allowing banks to adapt the approach to their specific needs and circumstances, while maintaining alignment with industry practices and regulatory expectations. Figure 5.1 offers a visual overview of the framework and is a combination of various methodologies assessed in Chapter 4, which results in a combined methodological approach covering all similarities and differences addressed in Section 4.3. The framework provides a structured approach for integrating ESG factors into IRB models, ensuring that financial institutions systematically address ESG risks in their credit risk assessments. The framework allows for a thorough evaluation of ESG risks across various industries, materiality levels, time horizons, and associated costs and proposes the first practical overview of ESG incorporation.

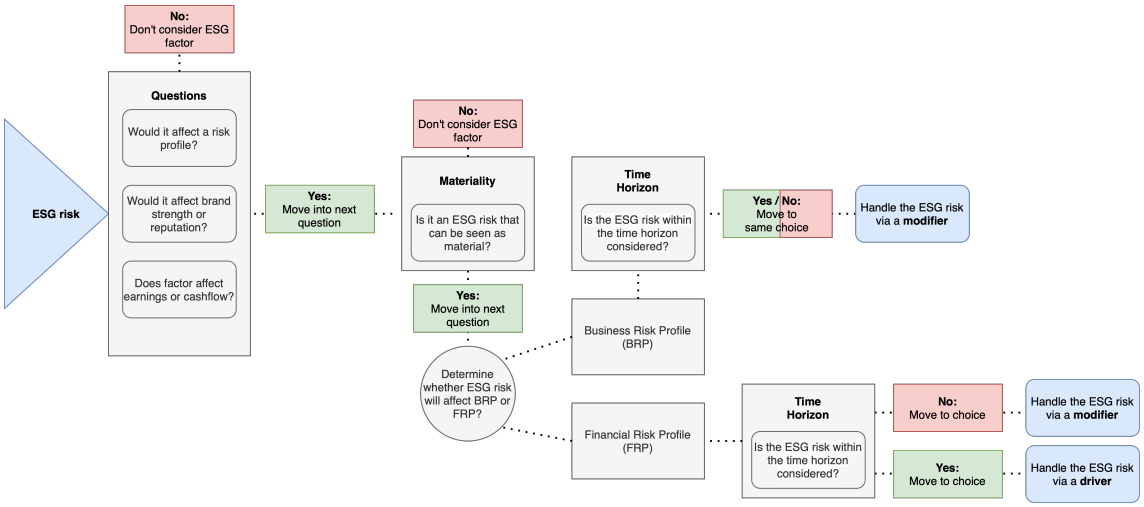


Figure 5.1: Overview of the framework used to determine which choice can be made based on the ESG risk.

Before using the framework, a modeler should start by assessing the industry of the company being evaluated. Since different sectors face distinct ESG risks, this first step ensures that the unique characteristics and exposures of the industry are accounted for. Different industries, such as energy, real estate, or finance, have varying ESG risk profiles based on their operational activities and geographical presence. Understanding the industry type allows the modeler to adjust the risk assessment process accordingly.

Once the industry is identified, the next step is to begin using the framework depicted in Figure 5.1, which provides a visual overview of the framework, summarizing the process for systematically integrating ESG factors into internal models at banks. This approach is designed to align with both regulatory standards and evolving market expectations, ensur-

ing that ESG risks are fully considered and appropriately quantified in the risk assessment process.

Three questions are raised that are based on the framework proposed by DBRS, which looks into the questions whether the ESG risk would theoretically affect a risk profile, whether brand strength or reputation would be hardmed, or wheter the risk factor affects earnigns or cashflow[2].

If one of the three questions can be answered with "Yes", the modeler can start to evaluate the materiality of the ESG risks specific to that company. Materiality, as handled in Section 4.3.4, refers to the relevance and significance of ESG factors in affecting the company's creditworthiness. This step ensures that the model focuses on ESG risks that could have a meaningful impact on financial performance and potential credit risk. Materiality is assessed by considering the magnitude of the ESG risks and how they relate to the company's current and future operations. The framework is made in such a way that the financial institution has flexibility in choosing their own materiality limits, as this could depend on strategic decisions or industry-specific differences.

After evaluating materiality, the time horizon of these risks is considered. ESG risks, particularly environmental risks, often have a long-term nature, and understanding when these risks may materialize is crucial for accurate forecasting and risk assessment. In this step, modelers assess how far ahead they need to look in order to capture the potential impact of ESG risks on the company's credit rating. This may involve examining both short-term and long-term risks, as certain ESG factors, like regulatory changes or climate events, might only become significant over extended periods.

The framework outlined here offers a structured yet flexible approach to integrating ESG factors into IRB models. It provides a step-by-step methodology that ensures a thorough evaluation of ESG risks across different industries, materiality levels, time horizons, and costs. While the approach follows a general sequence, it also allows for exceptions and adjustments, especially in cases where unique industry factors or specific company circumstances require tailored treatment. For example, certain sectors such as energy or mining might face more immediate and severe ESG risks that could affect their credit ratings in the short term, while other industries may see these risks materialize only in the long term.

5.2 Scenario Analysis

This section focuses on handling specific scenarios of ESG risks, particularly those guided by the CSRD, and provides practical recommendations for modelers on how to approach the (fictional) scenarios within their internal risk models. Given the complexities and long-term nature of many ESG risks, the scenarios discussed here reflect the potential challenges that may arise when incorporating ESG factors into credit risk assessments.

The recommendations aim to equip modelers with guidance on how to assess and integrate ESG risks based on the specific characteristics of each scenario. These scenarios are directly tied to the components of the CSRD (see Table 3.3), ensuring that the approach aligns with the latest regulatory expectations. By following these guidelines, risk modelers will be able to systematically address different ESG-related challenges, ranging from physical risk exposures to transitional risks, and incorporate them into their models with

[2]As discussed in Section 4.3.3 in the framework involves assessing the potential costs associated with the ESG risks identified. This includes evaluating the financial implications of these risks, whether they be costs related to physical risk (such as damage from environmental disasters), regulatory compliance, or the transition to more sustainable business practices. Quantifying these costs allows banks to understand the potential financial impact and make informed decisions when assessing credit risk.

greater clarity and precision.

Various real-world scenarios will be described, showing how to approach them with a focus on the industry, materiality, time horizon, and costs associated with the identified ESG risks. Through these case-based recommendations, modelers will gain valuable insights into best practices for integrating ESG considerations into their internal models and making informed decisions in line with evolving regulatory frameworks.

Climate Change (E1)

Recommendation 1 A utility company reliant on coal energy is exposed to the material risk of stranded assets as policies and market trends shift toward renewable energy sources. The IRB model could incorporate this material risk by adjusting the asset depreciation rates and projecting future cash flow reductions. This could result in a higher Probability of Default (PD), especially when assessing the company's short to medium-term financial outlook, considering the immediate costs of regulatory shifts and market demand changes.

Recommendation 2

The same utility company shows limited readiness to transition to low-carbon operations, highlighting a longer-term ESG risk. This lack of transition readiness should be captured as a qualitative modifier in the IRB model. The assessment would include factors such as the company's plans to adapt, the potential costs of delayed transition, and the risk of future regulatory and market disruptions. By including this modifier, the model reflects the increasing long-term risk in the company's credit rating, particularly as ESG expectations evolve over time.

Recommendation 3

For high-carbon industries, such as this utility company, an ESG overlay could be applied to account for broader sectoral risks. These could include long-term regulatory pressures, such as carbon pricing or emission restrictions, and shifts in market demand due to decarbonization trends. The overlay would factor in both the short-term costs of regulatory compliance and the long-term costs associated with transitioning to sustainable practices. This approach helps model the cumulative impact of ESG risks across industries, ensuring that sectoral risks are properly integrated into the IRB model.

The example illustrates the direct impact of regulatory shifts and market pressures on carbon-heavy industries. Depreciation of stranded assets and reduced cash flows highlight immediate financial risks, while transition readiness captures long-term ESG adaptation challenges. Sectoral overlays address decarbonization trends and regulatory expectations, ensuring comprehensive industry-wide risk adjustments.

Pollution (E2)

Recommendation 1 A chemical manufacturing firm that produces excessive waste faces increased operational costs due to stricter pollution mitigation regulations, which directly impact its short to medium-term profitability. The IRB model could incorporate these costs under a 'Profitability' driver, adjusting for immediate reductions in profitability due to compliance with environmental regulations. The model would consider the materiality of these costs, particularly in industries where regulatory pressures are intensifying, leading to more significant financial burdens in the near term.

Recommendation 2

In sectors with significant regulatory exposure, such as chemical manufacturing, the firm's vulnerability to pollution penalties and operational inefficiencies could be captured as a qualitative modifier. This modifier would adjust the risk rating based on the materiality of pollution risks, incorporating both short-term financial penalties and long-term costs such as fines, remediation, and loss of business reputation. The time horizon for this evaluation would consider both immediate impacts (e.g., regulatory fines) and longer-term risks (e.g., ongoing compliance costs, reputational damage).

Recommendation 3

Industry-specific overlays could be applied to account for the broader pollution risks faced by the chemical manufacturing sector. These overlays would increase the overall credit risk assessment, factoring in sector-wide trends such as tightening environmental regulations and potential shifts in market demand for cleaner products. The model would address both the immediate regulatory costs and the long-term sectoral changes driven by pollution concerns, such as shifts toward sustainable practices. This approach allows for a comprehensive view of the pollution risks, ensuring that both current and future risks are reflected in the risk profile.

The chemical manufacturing firm demonstrates how waste management inefficiencies and regulatory penalties lower profitability. Applying these risks as drivers emphasizes operational costs, while modifiers account for general inefficiencies. Industry-wide overlays ensure that pollution risks are consistently integrated into risk assessments for heavily regulated sectors.

Water and Marine Resources (E3)

Recommendation 1 A beverage company operating in water-scarce regions could face increased operational costs due to the need to source alternative water supplies. These additional costs would be reflected in the IRB model under an 'Operational Efficiency' driver, capturing the immediate impact on production costs. The model should consider the materiality of this risk, particularly in industries that are highly dependent on water resources, and reflect the short-term financial pressures resulting from water scarcity.

Recommendation 2

Regional or sector-specific water scarcity risks could be incorporated as a qualitative modifier in the IRB model. This modifier would reflect the operational sustainability challenges faced by companies in water-scarce areas. The time horizon considered here would address both short-term adjustments (e.g., sourcing alternative water supplies) and long-term risks (e.g., continuous strain on water resources). The modifier would help assess the broader, evolving impact of water scarcity on the company's financial viability over time.

Recommendation 3

Water-intensive industries, such as this beverage company, would have an ESG overlay applied to adjust risk weights based on water consumption and wastewater metrics. The overlay would be particularly relevant for assessing both the immediate costs of water procurement and wastewater treatment (short-term) as well as long-term sustainability risks associated with the depletion of water resources. This approach helps to account for both the current operational impact and future risks tied to water resource availability, ensuring that the model reflects the full spectrum of ESG-related risks over time.

Water scarcity challenges in the beverage industry reflect localized risks that disrupt production and increase costs. By addressing these through regional drivers and sectoral overlays, the IRB model ensures sustainability metrics are central to credit evaluations for water-intensive industries.

Biodiversity and Ecosystems (E4)

Recommendation 1 A logging company operating in sensitive ecosystems faces increased operational risks due to tightening environmental regulations, which may disrupt its operations. These risks could be captured under the 'Industry Risk' driver in the IRB model, reflecting the immediate potential for operational disruptions, such as stricter regulations on deforestation or habitat destruction. The materiality of these risks is significant, especially for companies heavily dependent on natural resources, and the model should consider both short-term financial impacts (e.g., fines, legal costs) and longer-term operational disruptions (e.g., changes in land use or supply chain disruptions).

Recommendation 2

Biodiversity risks, such as potential legal actions or conservation obligations, could be incorporated as a qualitative modifier in the IRB model. This modifier would account for the evolving legal and environmental conservation demands placed on industries like logging. The time horizon here should consider both the immediate regulatory changes (short-term) and the long-term environmental impacts (long-term), ensuring that the company's ability to adapt to stricter biodiversity-related laws is reflected in the credit risk assessment.

Recommendation 3

Sector-specific ESG overlays should be applied to industries like logging to account for biodiversity-related risks, increasing credit risk assessments. This overlay would adjust risk weights based on the company's exposure to biodiversity loss, conservation requirements, and the long-term viability of operations in environmentally sensitive areas. The overlay helps capture both the current operational risks and the long-term challenges companies face in maintaining sustainable practices within ecosystems that are under growing conservation pressure.

The logging company showcases biodiversity risks tied to regulatory compliance and conservation efforts in sensitive ecosystems. Operational disruptions and legal challenges are captured through qualitative modifiers, while overlays ensure uniform adjustments across industries with significant ecological impacts.

Resource Use and Circular Economy (E5)

Recommendation 1 A consumer goods company with inefficient resource use may face higher costs for raw materials and increased recycling efforts as the industry moves toward more sustainable practices. These inefficiencies could be integrated into an IRB model under the 'Operational Efficiency' driver. The materiality of these inefficiencies is significant, as the costs associated with raw material price fluctuations and the need for investment in more efficient recycling systems impact both short-term profitability and long-term operational sustainability. The time horizon should consider the immediate cost pressures as well as the longer-term benefits of transitioning to more efficient, circular production processes.

Recommendation 2

Resource use inefficiencies could be applied as a qualitative modifier in the IRB model, reflecting risks such as higher material costs, supply chain disruptions, and environmental impacts. This modifier would take into account the company's exposure to increased costs from inefficient resource use and the potential disruptions in supply chains due to reliance on finite resources. The time horizon for this modifier would consider both short-term cost impacts (e.g., higher procurement costs) and long-term risks associated with sustainability challenges (e.g., resource depletion and regulatory pressures on waste management).

Recommendation 3

For waste-heavy sectors, such as consumer goods, ESG overlays would be applied to reflect the adoption of circular economy practices. These overlays adjust credit risk assessments by accounting for the company's resource efficiency and its ability to reduce waste. The overlay would capture both the short-term financial costs of improving resource use (e.g., investment in new technologies) and the long-term benefits of more sustainable practices, such as reduced waste disposal costs and improved brand reputation. This approach ensures that both immediate and future resource management challenges are considered in the credit risk assessment.

The consumer goods example highlights inefficiencies in material use, driving up costs and reducing operational efficiency. Resource efficiency metrics in drivers and/or qualitative modifiers ensure a comprehensive approach, while overlays promote alignment with circular economy goals in waste-heavy sectors.

Own Workforce (S1)

Recommendation 1 A construction firm with high employee turnover may face increased recruitment and training costs, which can affect both its short-term operational efficiency and long-term profitability. These costs should be incorporated into the IRB model under the 'Profitability and Efficiency' driver. The materiality of these costs is significant, as high turnover rates directly impact the firm's ability to maintain a skilled workforce and sustain productivity. The model should consider both the immediate costs of recruitment and training, as well as the long-term impact on the firm's competitiveness and financial stability.

Recommendation 2

Frequent workplace injuries lead to reduced productivity, higher insurance premiums, and potential legal liabilities. These risks could be applied as a qualitative modifier in the IRB model, reflecting the long-term financial burden on the company due to inadequate health and safety practices. The modifier would take into account both the short-term costs (e.g., increased insurance premiums) and long-term consequences (e.g., higher claims, potential lawsuits, and damage to reputation). This approach ensures that the model captures both immediate and future risks related to workplace safety.

Recommendation 3

For labor-intensive sectors like construction, an ESG overlay would adjust credit risks based on health and safety metrics. This overlay would assess not only the company's current health and safety performance but also the potential costs of improving workplace safety and complying with regulations. The overlay considers both the short-term costs of implementing safety measures and the long-term benefits of reducing workplace accidents, improving employee retention, and enhancing the firm's reputation, which ultimately affects its creditworthiness.

The construction firm example shows the operational impact of workforce instability, which is part of the social factor "Own Workforce" under CSRD. High turnover and workplace injuries would increase costs and reduce productivity, while sectoral overlays ensuring broader health and safety considerations are factored into credit risk evaluations for labor-intensive industries.

Workers in the Value Chain (S2)

Recommendation 1

A retailer dependent on suppliers with poor labor practices may experience supply chain disruptions, operational inefficiencies, and reputational damage. These issues could be incorporated into the IRB model under the 'Competitive Position' driver, reflecting both the short-term financial impact (e.g., supply chain delays, increased costs) and long-term challenges (e.g., loss of market share due to reputational damage). The materiality of these risks depends on the retailer's dependence on specific suppliers and the broader industry's exposure to labor-related issues. The model should capture the immediate effects on profitability and competitiveness, as well as the longer-term implications for brand strength and customer loyalty.

Recommendation 2

Poor labor practices within the value chain could be captured as a qualitative modifier in the IRB model. This modifier would reflect heightened operational risks (such as disruptions in production or delivery) and reputational risks (including potential customer backlash and media scrutiny). The time horizon for these risks would encompass both short-term impacts (e.g., immediate supply chain disruptions) and long-term consequences (e.g., declining customer loyalty, regulatory scrutiny). This modifier helps adjust the risk rating to better reflect the full scope of potential financial impacts.

Recommendation 3

For manufacturing sectors, ESG overlays would be applied to reflect fair labor compliance risks, adjusting credit risk assessments accordingly. This overlay would account for both the immediate costs of addressing labor violations (such as fines or remediation costs) and the long-term reputational risks associated with non-compliance. The overlay would consider sector-specific risks, such as increasing regulatory pressure for fair labor practices and growing consumer demand for ethical sourcing, ensuring that credit risk assessments are aligned with industry trends and sustainability expectations.

The retailer example captures the financial and reputational risks tied to poor labor practices within the supply chain. By applying these risks as drivers and/or qualitative modifiers, the IRB model addresses operational disruptions and ensures fair labor practices are consistently evaluated across industries.

Consumers and End-users (S3)

Recommendation 1

A pharmaceutical company facing product recalls due to safety issues may experience significant revenue losses and reputational harm. These factors could be incorporated into the IRB model under the 'Market Demand' driver, reflecting both the short-term financial impacts (e.g., immediate loss of sales, costs associated with product recalls) and long-term challenges (e.g., loss of consumer trust, decline in market share). The materiality of these risks is substantial, particularly in industries where consumer confidence and regulatory compliance are critical. The model should account for the direct financial effects of safety issues as well as the lasting damage to brand reputation over time.

Recommendation 2

Product safety issues could be applied as a qualitative modifier in the IRB model, adjusting risk ratings for industries with significant consumer risks, such as pharmaceuticals. This modifier would reflect heightened operational and reputational risks that arise when safety issues occur, taking into account both immediate effects (e.g., the costs of recalling products) and long-term consequences (e.g., potential lawsuits, loss of consumer loyalty). The time horizon here would span both the short-term recovery from the recall and the longer-term reputation repair efforts, ensuring that the company's risk profile reflects both the immediate and ongoing impact of safety issues.

Recommendation 3

ESG overlays for consumer industries, such as pharmaceuticals, would adjust risk weights for safety-sensitive sectors based on product recall and safety metrics. The overlay would consider both the current safety performance of the company and potential future risks tied to product safety. For industries like pharmaceuticals, where safety is paramount, this approach helps ensure that both the immediate impact of product recalls and the long-term reputational and regulatory risks are properly factored into the credit risk assessment, enhancing the model's ability to capture the full spectrum of risks associated with product safety.

The pharmaceutical company demonstrates how product safety issues can harm revenue and reputation. By integrating these risks into drivers and/or sectoral overlays, the IRB model captures consumer-facing risks that are critical to maintaining market demand.

Affected Communities (S4)

Recommendation 1

A mining company facing protests from affected communities may experience significant project delays, increased operational costs, and potential regulatory scrutiny. These factors could be captured under an 'Operational Risk' driver in the IRB model, reflecting both the immediate costs of project disruptions (e.g., legal fees, security costs) and long-term delays that may hinder the company's ability to deliver projects on time. The materiality of these risks depends on the sensitivity of the region, the scale of community opposition, and the company's reliance on the project for revenue generation.

Recommendation 2

Community opposition could be applied as a qualitative modifier in the IRB model to reflect potential reputational and operational risks. This modifier would consider both the short-term operational impacts (e.g., protest-related disruptions) and the longer-term risks associated with reputational damage (e.g., loss of social license to operate, reduced future investment). The time horizon should encompass both the immediate effects of opposition and the longer-term challenges to maintaining positive relationships with affected communities.

Recommendation 3

ESG overlays for high-risk sectors like mining would include community impact assessments, adjusting risk weights for projects in sensitive areas. This overlay would account for the immediate operational risks tied to community opposition, such as project delays and increased costs, as well as the long-term risks associated with ongoing social conflicts, legal liabilities, and the need for community engagement strategies. By incorporating these factors, the model captures both current and future ESG risks, ensuring a comprehensive risk assessment for mining projects located in or near sensitive communities.

The mining company example highlights the reputational and operational risks of community opposition. Integrating these risks through qualitative modifiers and ESG overlays would ensure a balanced evaluation of localized impacts on creditworthiness.

Business Conduct (G1)

Recommendation 1

A corporation with governance issues, such as a lack of transparency or inadequate board oversight, may experience reduced investor confidence and difficulty in accessing capital. These factors could be integrated into a 'Management Quality' driver in the IRB model, reflecting both the immediate financial impact (e.g., reduced share prices, higher cost of capital) and the longer-term consequences (e.g., loss of market position, difficulty attracting strategic partners). The materiality of governance issues is significant, especially in industries where investor perception and regulatory compliance are paramount. The time horizon should capture both the short-term market reaction and the longer-term risks associated with governance challenges.

Recommendation 2

A history of anti-corruption violations, legal disputes, or non-compliance with regulations could be applied as a qualitative modifier in the IRB model, increasing the PD. The model should account for both the immediate reputational damage (e.g., fines, loss of business) and the longer-term impact on future business opportunities, regulatory scrutiny, and financial performance. The modifier would adjust for both short-term impacts (e.g., penalties, legal costs) and long-term risks (e.g., increased regulatory oversight, future legal liabilities).

Recommendation 3

ESG overlays would be used to address governance transparency and regulatory compliance within corporate positioning, adjusting credit risk assessments accordingly. This overlay would reflect the company's adherence to governance best practices and its ability to comply with evolving regulatory frameworks. The overlay would consider both the immediate cost of ensuring transparency (e.g., investing in compliance systems) and the long-term value of maintaining strong governance (e.g., enhanced investor confidence, access to favorable financing terms). This approach ensures that both current governance practices and future compliance risks are appropriately captured in the credit risk assessment.

The example of a corporation with anti-corruption violations showcases governance risks that diminish investor confidence and increase regulatory scrutiny. Applying governance-related drivers, modifiers, and overlays ensures a thorough evaluation of transparency and compliance across industries.

The proposed recommendations provide banks (such as ING) with the flexibility to choose integration methods that align with their specific risk management strategies and available data. By adopting practices already employed by CRAs, banks can ensure their IRB models comply with regulatory expectations while improving their capacity to address ESG-related risks. This approach allows for a gradual incorporation of ESG factors, prioritizing those most relevant to their portfolios (based on materiality of those risks), while also enabling adjustments to the complexity of integration based on internal capabilities. Additionally, it ensures that ESG integration efforts are closely aligned with the bank's strategic objectives and stakeholder expectations.

Chapter 6

Conclusion

This thesis examines the integration of ESG factors into credit risk assessments through the usage of methodologies by ECAIs. Specifically, it addresses the opportunities and limitations of traditional credit rating methodologies of ECAIs and looks into solutions to enhance implementation of ESG and ESG disclosure within credit risk models. The central research question guiding this study is:

"How do ESMA-registered External Credit Assessment Institutions (ECAIs) integrate ESG factors into their credit rating methodologies?"

To address this question, four sub-questions were investigated, where **RQ1** was defined as: *How are ESG factors currently defined and categorized within the credit rating methodologies of ECAIs?* The answer found in the thesis to this question is that ESG factors are inconsistently defined and categorized across ECAIs. Some institutions explicitly treat ESG as standalone criteria, while others try to integrate them into broader categories like operational (business risk profiles) or financial risks (financial risk profiles). This lack of standardization complicates efforts to compare credit ratings across ECAIs. A standardized approach to defining and categorizing ESG factors is critical for creating transparency and improving comparability.

For the second sub-question, **RQ2**, the question investigated: *What specific ESG sub-factors are most commonly integrated into credit risk assessments?* The investigation in the thesis found that governance-related sub-factors are most consistently included in credit risk assessments. Environmental factors, particularly those related to climate resilience and carbon intensity, are prominent in sectors with high regulatory exposure. Social sub-factors, such as labor conditions and community engagement, are less universally applied but are becoming increasingly relevant. The findings highlight that the integration of ESG sub-factors in corporates often depends on the industry and geographic focus, showing the need for tailored approaches to the specific case.

The third sub-question, **RQ3**, asks: *What are the implications of ESG integration on the comparability and consistency of credit ratings among ECAIs?* The integration of ESG factors into credit ratings impacts the comparability and consistency of assessments among ECAIs. A lack of standardization in how ESG factors are defined, weighted, and incorporated into methodologies leads to inconsistent frameworks[1], complicating direct comparisons between agencies. Subjectivity in assigning importance to specific ESG factors further contributes to discrepancies, with different ECAIs often arriving at varying conclusions for

[1]It has to be addressed that CRAs already had quite significant differences in their way of assessing credit risk before the incorporation of ESG.

the same entity or asset (which could be related back to their differences in methodological approaches). This means, however, that there is room for own interpretation in the incorporation of ESG in credit rating methodologies. Limited transparency makes the issue bigger, as many CRAs provide insufficient disclosure about how ESG factors influence their ratings, reducing stakeholders' ability to evaluate and compare methodologies effectively.

The last sub-question, **RQ4**, handles the following question: "How can a set of heuristics be developed to guide financial institutions in integrating ESG considerations into their credit risk models?" The thesis proposes a conceptual framework that focuses on variables identified through the methodologies of CRAs. The framework looks into four key factors: industry, materiality, time horizons, and costs related to ESG risks.

The first factor, industry, shows that ESG factors can vary in impact depending on the sector. Industries with high environmental exposure, for example, face different risks compared to sectors like technology or services. Therefore, financial institutions should tailor their ESG risk assessments based on the specific challenges and opportunities within each industry. Materiality emphasizes the need to prioritize ESG factors that are most significant to an entity's long-term performance and creditworthiness. Not all ESG risks are equally relevant across industries, and the framework suggests focusing on those risks that are material to the business in question. This would make sure that financial institutions assess ESG variables that have the most considerable influence on credit risk. Time horizon is the third factor in the framework, as ESG risks often extend over a longer period than the credit rating itself. It is essential to try and account for both short-term and long-term time horizons when evaluating these ESG risks, if possible. For example, while climate-related risks may not manifest immediately, they could significantly affect a company's financial stability and increase its PD over time. This long-term perspective helps ensure that the credit risk models account for risks that may materialize in the future. The model proposes modifications to credit ratings for the longer time horizons (see Figure 5.1). The fourth factor (costs related to ESG risks) considers the financial implications of ESG factors. These costs can be both direct, such as the costs of complying with environmental regulations, and indirect, such as reputational damage or disruptions to operations. The framework suggests trying to integrate these costs into credit risk assessments through a financial profile building block, allowing financial institutions to quantify the financial risks posed by ESG factors more accurately.

6.1 Limitations & Future Work

While the thesis provided valuable insights into the integration of ESG factors in credit ratings by ECAIs, several limitations must be acknowledged. The key limitations identified are as follows:

- ◇ **Short timeframe.** The research was conducted over a relatively brief period, limiting the depth of data collection and analysis. This constraint may have impacted the comprehensiveness of the findings and their applicability to evolving frameworks.
- ◇ **Regulatory landscape evolution.** Given the dynamic nature of ESG-related regulations and credit rating methodologies, the findings of this thesis are subject to rapid obsolescence. It is likely that certain aspects will become outdated within a year as new regulations and practices emerge.
- ◇ **Reliance on available disclosures.** The study heavily relied on publicly available ESG and credit rating disclosures from ECAIs. While efforts were made to gather

comprehensive information, gaps in disclosure quality and transparency may have impacted the completeness and accuracy of the findings.

- ◇ **Evolving ESG definitions and metrics.** The definitions and metrics for ESG factors are still evolving, which may have affected the consistency and comparability of the ESG-related assessments across different ECAIs.
- ◇ **Subjectivity in ESG integration evaluation.** ESG factor integration often involves subjective judgments by rating analysts and the author for reading the documentation. This subjectivity introduces variability in the interpretation of ESG factors and their materiality, potentially influencing the outcomes of the thesis.

Building upon the findings and limitations discussed in the previous sections, several opportunities for future research in the integration of ESG factors into credit ratings emerge. By exploring these possibilities, future studies can contribute to advancing this research field and work towards the development of more transparent, consistent, and comprehensive ESG integration methodologies. The following areas for future exploration have been identified:

- ◇ **Comprehensive analysis of all ECAIs defined by ESMA.** Expand the scope of research to include all ESMA-registered ECAIs, providing a complete overview of ESG integration practices across the regulatory landscape.
- ◇ **Incorporation of additional asset classes.** Investigate how ESG factors are integrated into credit ratings for asset classes beyond corporates, such as specialized lending, financial institutions, and sovereigns.
- ◇ **Industry-specific ESG assessments.** Explore how ESG factor integration varies across industries, identifying sector-specific challenges, opportunities, and materialities.
- ◇ **Exploration of ESG factor materiality by asset class.** Analyze the relative importance of ESG sub-factors, such as transition risk or governance practices, across different asset classes.

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During the preparation of this work the author used ChatGPT/OpenAI in order to paraphrase sentences for this work. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the work.

Appendix A

Selected Papers

Table A.1: Selected papers related to ESG and credit ratings.

Author(s)	Title	Year	Citations
Chen S.; Song Y.; Gao P.	Environmental, social, and governance (ESG) performance and financial outcomes: Analyzing the impact of ESG on financial performance	2023	345
Baum C.F.; Schäfer D.; Stephan A.	Credit rating agency downgrades and the Eurozone sovereign debt crises	2016	24
Bhattacharya S.; Sharma D.	Do environment, social and governance performance impact credit ratings: a study from India	2019	35
Kiesel F.; Lücke F.	ESG in credit ratings and the impact on financial markets	2019	28
Bernardelli M.; Korzeb Z.; Niedziółka P.	Does Fossil Fuel Financing Affect Banks' ESG Ratings?	2022	15
Klusak P.; Agarwala M.; Burke M.; Kraemer M.; Mohaddes K.	Rising Temperatures, Falling Ratings: The Effect of Climate Change on Sovereign Creditworthiness	2023	23
Chodnicka-Jaworska P.	Environmental, Social, and Governance Impact on Energy Sector Default Risk—Long-Term Issuer Credit Ratings Perspective	2022	12
Louizi A.; Kammoun R.	Evaluation of corporate governance systems by credit rating agencies	2016	22
Ahn M.; Bonsall S.B., IV; Van Buskirk A.	Do managers withhold bad news from credit rating agencies?	2019	49

Oliver Yébenes M.	Climate change, ESG criteria and recent regulation: challenges and opportunities	2024	33
Lazarides T.; Drimpetas E.	Defining the factors of Fitch rankings in the European banking sector	2016	24
Cash D.	Can credit rating agencies play a greater role in corporate governance disclosure?	2018	10
Lim T.	Environmental, social, and governance (ESG) and artificial intelligence in finance: State-of-the-art and research takeaways	2024	5
Chi Y.-L.; Flynn S.	The impact of credit rating information on disclosure quality	2022	42
Sager F.; Hinterleitner M.; Hazakis K.J.; Exadaktylos T.; Zahariadis N.; Luckhurst J.	How Do Credit Rating Agencies Rate? An Implementation Perspective on the Assessment of Austerity Programs during the European Debt Crisis	2016	32
Caridad L.; Núñez-Tabales J.; Seda P.; Arencibia O.	Do moody's and s&p firm's ratings differ?	2020	13
Plakandaras V.; Gogas P.; Papadimitriou T.; Doumpa E.; Stefanidou M.	Forecasting credit ratings of EU banks	2020	15
Zioło M.; Bąk I.; Cheba K.; Filipiak B.Z.; Spoz A.	Environmental, social, governance risk versus cooperation models between financial institutions and businesses. Sectoral approach and ESG risk analysis	2023	2
Lim K.-T.; Goh K.-L.	Does Environmental Factor Influence the Rating of Creditworthiness? A Comparative Analysis of Developed versus Developing Countries	2024	28

Appendix B

Registered and Certified ECAI Overview

Table B.1 lists 24 ECAIs registered under the European Securities and Markets Authority (ESMA), along with the type of regulatory use for their ratings. Solicited ratings are credit ratings requested and paid for by the entity being rated, such as a company or government <**empty citation**> In contrast, unsolicited ratings are issued without the entity's request and are typically based on publicly available information <**empty citation**>

Table B.1: ECAIs and their regulatory use according to ESMA.

#	**ECAI**	**Regulatory Use**
1	Fitch Ratings Ireland Limited	Both solicited and unsolicited ratings
2	S&P Global Ratings Europe Limited	Both solicited and unsolicited ratings
3	Moody's Investors Service	Both solicited and unsolicited ratings
4	DBRS Rating GmbH	Both solicited and unsolicited ratings
5	EthiFinance Ratings	Both solicited and unsolicited ratings
6	Kroll Bond Rating Agency Europe Limited	Both solicited and unsolicited ratings
7	ARC Ratings S.A.	Both solicited and unsolicited ratings
8	BCRA – Credit Rating Agency AD	Both solicited and unsolicited ratings
9	HR Ratings de México, S.A. de C.V.	Both solicited and unsolicited ratings
10	Scope Ratings GmbH	Both solicited and unsolicited ratings
11	Egan-Jones Ratings Co.	Both solicited and unsolicited ratings
12	Japan Credit Rating Agency Ltd	Both solicited and unsolicited ratings
13	ICAP S.A.	Both solicited and unsolicited ratings
14	Capital Intelligence Ratings Ltd	Both solicited and unsolicited ratings
15	modeFinance S.r.l.	Both solicited and unsolicited ratings
16	Rating-Agentur Expert RA GmbH	Both solicited and unsolicited ratings
17	CRIF Ratings S.r.l.	Both solicited and unsolicited ratings
18	GBB-Rating GmbH	Both solicited and unsolicited ratings
19	Creditreform Rating AG	Both solicited and unsolicited ratings
20	Cerved Rating Agency S.p.A.	Both solicited and unsolicited ratings
21	INBONIS S.A.	Both solicited and unsolicited ratings
22	Assekuranz Rating-Agentur GmbH	Only solicited ratings
23	Nordic Credit Rating AS	Only solicited ratings
24	A.M. Best (EU) Rating Services B.V.	Only solicited ratings

Appendix C

CRA Methodology Overview

C.1 CRA Selection Process

The flowchart depicted in Figure C.1 provides a structured approach for selecting ECAIs based on the availability of their methodologies and the integration of ESG factors. The process begins with an initial ECAI list[1], where all ECAIs under ESMA are considered. For each ECAI, the methodology availability and ESG coverage are evaluated in several steps to ensure only those with sufficient ESG integration are selected.

Each ECAI is examined individually. The first step is to check if the ECAI provides a general corporate methodology. If this methodology is available, the process proceeds to check if this general methodology also exists for financial institutions. If either one of these two methodologies is not available, the evaluation then checks for a sector-specific methodology for the specific industry (either corporates or financial institution). This would sometimes provide approximately the same information on the credit rating determination process and integration of ESG compared to the general corporate or financial institutions methodology. If neither of the methodologies is found, the ECAI is removed from the final selection.

If an ESG document exists, it is examined to determine whether it includes usable information specific to ESG factors. If the ESG document does not contain relevant or usable information, the ECAI is similarly removed from the list, ensuring that only those institutions with comprehensive ESG coverage proceed further. If a comprehensive ESG document is available, the respective ECAI is immediately to the final selection, as this could provide valuable insights into ESG incorporation. Once the methodology availability has been positively determined, the process continues by assessing whether the available methodologies contain usable information on ESG factors. This begins with a decision point that determines whether to evaluate the general or sector-specific methodology, based on availability. If a general methodology is present, it is checked to see if it contains usable information on ESG aspects. Should neither the general nor the sector-specific methodologies contain relevant ESG information, the ECAI is removed from the list. ECAIs that meet all the criteria are added to the final (selected) ECAI list. This systematic approach ensures that only ECAIs with adequate ESG documentation and integration across their methodologies are selected, allowing for a focused analysis of how each ECAI incorporates ESG factors into their credit assessment frameworks for either corporates or financial institutions.

[1]This initial list is based on the ECAIs listed under ESMA, as depicted in Table B.1.

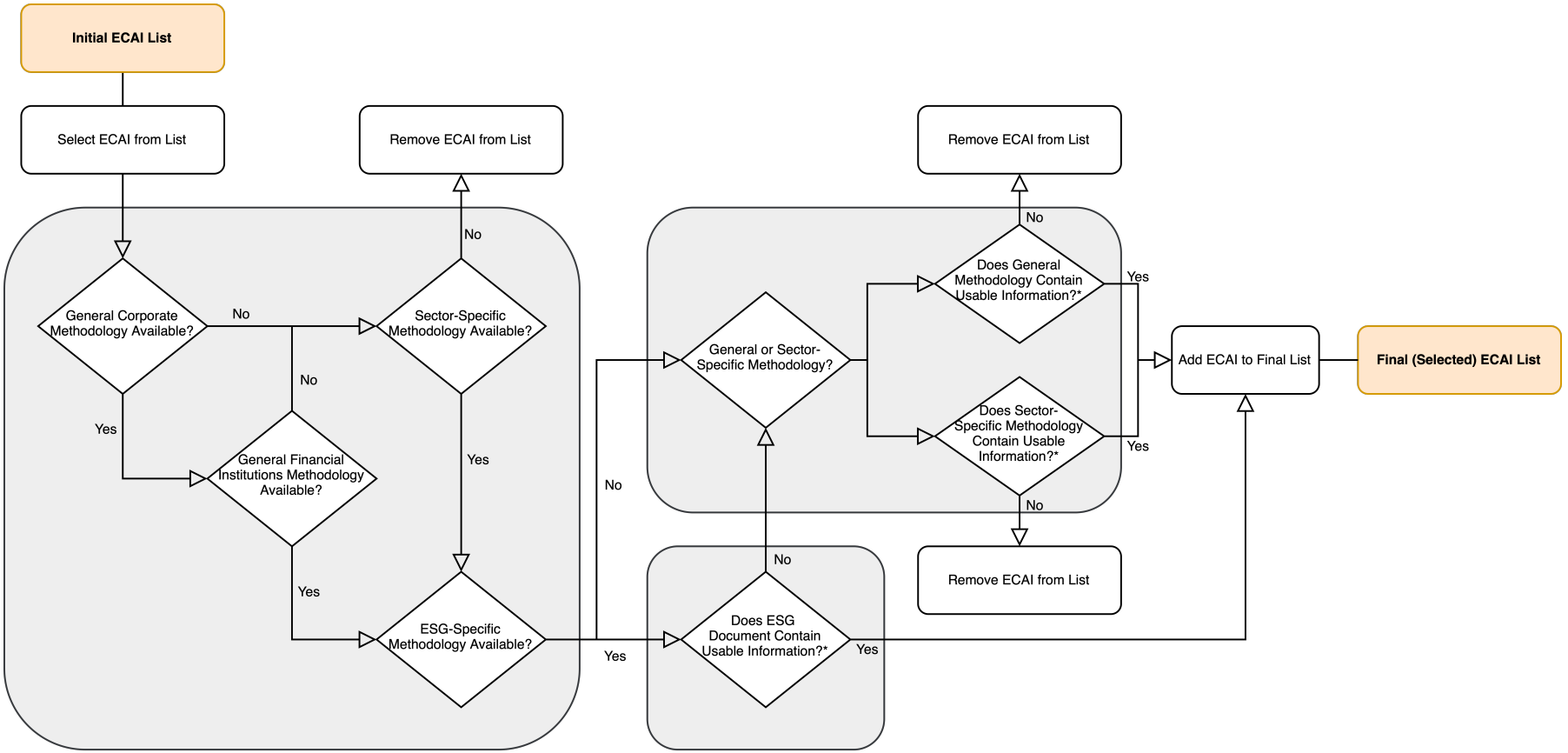

Figure C.1: Overview of the framework used to determine which ECAIs will be explored.

*: This process is explained in Section 2.2.4.

C.2 CRA Methodology Explanations

C.2.1 S&P Global Ratings Europe Limited (S&P)

S&P incorporates ESG factors qualitatively and quantitatively within the frameworks' drivers but does not disclose specific numerical adjustments.

General

Two building blocks are combined into an anchor, which gets adjusted by **six** modifiers.

ESG Integration

ESG factors are **implicitly** integrated in the rating process.

Find S&P Global Ratings Europe Limited press releases for Corporates via this link.

Building Block(s) and Driver(s)

The *S&P Corporate Methodology* is structured with foundational building blocks that form the basis of credit assessment, focusing on both Business Risk Profile (BRP) and Financial Risk Profile (FRP). According to *S&P's Corporate Methodology*, these building blocks have specific drivers that offer insights into the company's competitive and financial standing [76]. These drivers within the risk profiles are explained in Table C.1.

The BRP comprises the risk and return potential for a company in the markets in which it participates, the competitive climate within those markets (its industry risk), the country risks within those markets, and the competitive advantages and disadvantages the company has within those markets (its competitive position) [76]. The FRP is the outcome of decisions that management makes in the context of its business risk profile and its financial risk tolerances. This includes decisions about the manner in which management seeks funding for the company and how it constructs its balance sheet. It also reflects the relationship of the cash flows the organization can achieve, given its business risk profile, to the company's financial obligations [76]. Key drivers and their respective subfactors are explained.

Table C.1: Key drivers and subfactors for the S&P corporate methodology [76]. Other documents assessed will be referenced individually.

Building Block	*Driver*	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Business Risk Profile (BRP)[1]	Country risk	Corporate entities operating within a single country will receive a country risk assessment for that jurisdiction. For entities with exposure to more than one country, the criteria prospectively measure the proportion of exposure to each country.[3]	✗	1 (lowest risk) to 6 (highest risk)	Forecasted EBITDA, revenues, fixed assets, other appropriate financial measures
	Industry risk	Industry risk assesses the characteristics of a sector's overall competitive risk and growth environment, examining the effectiveness of industry barriers to entry, profit margins, secular change risks, and growth trends [101].	✓	1 (very low risk) to 6 (very high risk)	Cyclicality, competitive risk and growth [101]
	Competitive position	Competitive position encompasses company-specific factors that can add to or offset industry and country risk.	✓	1 (excellent) to 6 (vulnerable)	Competitive advantage (market positioning, barriers to entry), scale, scope, and diversity (product/geographic), operating efficiency (cost structure, technology), profitability (level,[4] and volatility)
Financial Risk Profile (FRP)	Cash flow/leverage	The criteria assess various credit ratios, focusing on different levels of cash flow in relation to obligations and identifying key ratios relevant to credit risk.	✓	1 (minimal) to 6 (highly leveraged)	Core ratios (FFO/debt, Debt/EBITDA), supplementary coverage ratios (EBITDA/interest), payback ratios (CFO/debt)

[1] The assessments for BRP are: 1, excellent; 2, strong; 3, satisfactory; 4, fair; 5, weak; and 6, vulnerable.
[2] The assessments for FRP are: 1, minimal; 2, modest; 3, intermediate; 4, significant; 5, aggressive; and 6, highly leveraged.
[3] Arriving at a company's blended country risk assessment involves multiplying its weighted-average exposures for each country by each country's risk assessment and then adding those numbers.
[4] Historical and projected return on capital, EBITDA margin, and/or sector-relevant measures.

The anchor rating is calculated by assessing the BRP and FRP on based on a predetermined scale in a table, where each combination corresponds to a specific anchor rating outcome, found in Table 3 of the *S&P Corporate Methodology* [76].

Modifier(s)

Table C.2: Key modifiers in S&P corporate methodology. Based on S&P corporate methodology document [76]. Additional documents will be referenced individually.

Modifier	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Diversification/ portfolio effect	Applies to companies that S&P regards as conglomerates. They are companies that have multiple core business lines that may be operated as separate legal entities.	✗	Significant (1), moderate (2), neutral (3)	Degree of correlation of business lines, number of business lines
Capital structure	Criteria to assess risks in a company's capital structure that may not show up in standard analysis of cash flow/leverage. May exist as a result of maturity date or currency mismatches between a company's sources of financing and its assets or cash flows. Can be compounded by outside risks, such as volatile interest rates or currency exchange rates.	✗	1 (very positive) to 5 (very negative)	Currency risk associated with debt, debt maturity profile (or schedule), interest rate risk associated with debt, investments
Financial policy	Refines the view of a company's risks beyond the conclusions arising from the standard assumptions in the cash flow/leverage assessment.	✗	Positive (1), neutral (2), negative (3)	Leverage tolerance, dividend policy, acquisition strategy
Liquidity	Assesses the potential for a company to breach covenant tests related to declines in EBITDA, as well as its ability to absorb high-impact, low-probability events (such as those that may arise from the materialization of ESG risks), the nature of the company's bank relationships, its standing in credit markets, and how prudent (or not) S&P believes its financial risk management to be.	✓	1 (exceptional) to 5 (weak)	Cash and liquid investments, forecasted funds from operations (FFO) (if positive), forecasted working capital inflows (if positive), proceeds of asset sales, the undrawn available portion of committed credit facilities maturing beyond the next 12 months, expected ongoing support [102]
Management and governance	Describing the analytical framework for evaluating management and governance factors that are relevant to the analysis of credit risk.	✓	1 (positive) to 4 (negative)	Ownership structure, board structure, composition, and effectiveness, risk management, internal controls, and audit, transparency and reporting, management [103]
Comparable rating analysis	The application of comparable ratings analysis reflects the need to "fine-tune" ratings outcomes, even after the use of each of the other modifiers. A positive or negative assessment is therefore likely to be common rather than exceptional.	✓	Positive (+ one-notch), neutral, negative (- one-notch)	Considering assessments of each of the underlying subfactors to be points within a possible range

ESG Disclosure

Within the S&P credit rating framework, ESG factors are generally considered implicit. This means they are integrated into various components of the rating process rather than being treated as standalone factors. Environmental factors, such as climate transition risks

and regulatory fines related to pollution, are reflected in the competitive position and financial risk profile, particularly in profitability and cash flow metrics. Social factors, like aging population trends or the impact of social distancing during pandemics, influence industry risk and demand considerations within the business risk profile. Governance factors, including deficiencies in risk management, legal infractions, and governance failures, are incorporated into the management and governance modifier and the competitive position. Although ESG factors are integrated indirectly, they play a crucial role in influencing various building blocks, particularly when assessing risks that could affect the company's long-term creditworthiness. This can be seen in Figure 4.1, where one can see the most important places where ESG impacts credit ratings. The principles for applying ESG factors are described in Table C.4.

Climate transition risk and physical risk-related factors may be among the most significant ESG credit factors that affect the creditworthiness of rated entities. This is primarily because of policymakers' efforts to reduce emissions or to ensure that greenhouse emissions reflect their full social costs ("climate transition risk") and climate change, which is leading to more frequent and severe extreme weather events ("physical risk") [75]. For a more in-depth overview of ESG credit factors, see Table C.3. This table has been based on the *General Criteria: Environmental, Social, And Governance Principles In Credit Ratings* document by S&P[2] [75].

Table C.3: ESG factors in S&P's ESG documentation for corporates [75].

Environmental Factors	*Social Factors*	*Governance Factors*
Climate transition risks	Health and safety	Governance structure
Physical risks	Social capital	Risk management, culture, and oversight
Natural capital	Human capital	Transparency and reporting
Waste and pollution	Other social factors	Other governance factors
Other environmental factors		

[2] https://www.spglobal.com/ratings/en/research/articles/211010-general-criteria-environmental-social-and-go

Table C.4: General principles of how ESG credit factors can influence credit ratings. Based on S&P ESG guidelines [75].

Principle	*Description*
Principle One	The long-term issuer credit ratings do not have a pre-determined time horizon.[1]
Principle Two	The current and potential future influence of ESG credit factors on creditworthiness can differ by industry, geography, and entity.[2]
Principle Three	The direction of and visibility into ESG credit factors may be uncertain and can change rapidly.[3]
Principle Four	The influence of ESG credit factors may change over time, which is reflected in the dynamic nature of our credit ratings.[4]
Principle Five	Strong creditworthiness does not necessarily correlate with strong ESG credentials and vice versa.[5]

[1] S&P's long-term ratings do not have a fixed horizon. While ratings include forecasts, they may not account for highly uncertain ESG-related events. However, as visibility improves, ESG factors like climate transition risks can be incorporated more directly.

[2] The influence of ESG factors varies by industry, geography, and entity. Certain industries (e.g., fossil fuels) or geographies (e.g., areas vulnerable to extreme weather) face greater ESG risks. Entities may mitigate these risks through adaptation or insurance.

[3] ESG factors are uncertain and can change quickly. Factors like climate change and public policy shifts are hard to predict over the long term, and rapid changes can impact creditworthiness unpredictably.

[4] Credit ratings are dynamic and may adjust as ESG factors evolve. Ratings are updated as new information (e.g., regulations) becomes available, and previously immaterial risks can become significant.

[5] Strong creditworthiness does not imply strong ESG characteristics, and vice versa. An entity may be creditworthy despite poor ESG characteristics or may face financial instability despite a positive ESG profile. Balancing stakeholder interests in ESG can sometimes conflict with financial stability.

Example S&P ESG Evaluation Process for Corporates

A company emits significant greenhouse gases from its production process and, as a result, is exposed to climate transition risk. The company's posttax profitability declined last year and is forecast to fall further because of levied carbon taxes, which has weakened the debt service ratios, reflected in cash flow leverage. S&P thinks the company is vulnerable to even more profitability declines because of possible carbon tax rate increases. Several lenders, insurers, and investors have stated their intention to reduce lending, investment, and provision of insurance coverage to the industry by 2030. S&P applies a negative comparable ratings analysis adjustment to capture the carbon profitability risk beyond the financial forecast period and the risk of reduced access to debt, equity, and insurance. As a result, the ratings on the company are one notch lower than they otherwise would have been. The ratings surveillance of the company continues to focus on the public policy debate regarding whether and when carbon tax rates could increase, and the exposure of lenders, investors, and insurers to the industry and the company, which will influence liquidity risk and risk mitigation (through insurance).

C.2.2 Moody's Investors Service (Moody's)

The level of ESG integration varies across sectors, with sector-specific methodologies providing detailed insights on the relevance and materiality of these factors. These methodologies help identify which ESG aspects are most significant for issuers in different industries.

General

One building block containing different weighted drivers, which gets adjusted by **three** modifiers.

ESG Integration

ESG factors are **implicitly** integrated in the rating process.

Find Moodys Investors Service press releases for Corporates via this link.

Building Block(s) and Driver(s)

Table C.5 highlights Moody's key rating building block, drivers and subfactors for corporates. Each driver within the scorecard, from scale and business profile to leverage and financial policy, offers insight into distinct aspects of a company's risk profile. Scale measures the company's market presence and resilience, a factor critical for sustaining cash flows and supporting investments in growth. The business profile assesses strengths and weaknesses in generating stable earnings, examining aspects like market position and product diversification, which impact a company's capacity to weather economic shifts. Operating profits are needed for a company to generate sustainable cash flows to invest in items such as marketing, research, factory and personnel and therefore maintain its competitive position [97]. An increase in leverage and its associated costs can limit a company's financial flexibility, reduce cash flows available for debt service and can increase the issuer's risk of default [97]. Very conservative financial policies, including risk and liquidity management, and a commitment to a strong credit profile are indicative of lower risk to creditors [97].

Table C.5: Key drivers and subfactors for Moody's corporate methodology [97]. Additional documents assessed will be referenced individually.

Building Block	*Driver*	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Scorecard	Scale	Provides insights into the overall depth of a company's business, its success in attracting customers, and its ability to withstand economic cycles or unexpected shocks.	✗	"Aaa" to "Ca"[1]	Revenue size in USD billions
	Business Profile	Reflects key strengths and weaknesses of the issuer's enterprise. Influences the issuer's ability to generate sustainable earnings and operating cash flows, through cycles and shocks.	✗	"Aaa" to "Ca"[1] Revenue size in USD billions	Market position, product diversification, Revenue and margin stability, supply chain management, end-market stability, cost control
	Profitability and Efficiency	Provides insights into the overall depth of a company's business, its success in attracting customers, and its ability to withstand economic cycles or unexpected shocks.	✗	"Aaa" to "Ca"[1]	EBITA/Revenue[2], EBITA margin
	Leverage and Coverage	Reflects the size of an issuer's debt obligations relative to its operating profits and cash flow, and is an indicator of how much financial risk it is willing to undertake.	✗	"Aaa" to "Ca"[1]	Debt/EBITDA, Retained Cash Flow/Net Debt, Free Cash Flow/Debt, EBITA/Interest Expense
	Financial Policy	Encompasses management and board tolerance for financial risk.	✗	"Aaa" to "Ca"[1]	Risk and liquidity management track record, shareholder returns vs. creditor interests, event risk, stability of metrics, commitment to credit profile

[1] Rating scores possible: "Aaa", "Aa", "A", "Baa", "Ba", "B", "Caa", "Ca".
[2] Moody's considers EBITA, which incorporates depreciation expenses, as a percentage of revenue, a useful measure of profitability for manufacturing companies, which reinvest in property, plant and equipment to stay competitive.

Modifier(s)

Various modifiers are considered within Mood's methodology, according to Table C.6 [97].

Table C.6: Key modifiers in Moody's corporate methodology. Based on Moody's corporate methodology document [97]. Additional documents will be referenced individually.

Modifier	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Rating Committee Judgment (Instrument Considerations)	Issuers are all different. Rating committees will apply their judgment in determining the rating factors that are of particular significance for a particular issuer, given, for example, the prevailing operating environment or idiosyncratic strengths and weaknesses.	✗	N.A.	N.A.
Other Considerations	Other considerations that are outside the scorecard may be important for ratings, and their relative importance may also vary from company to company.	✓	N.A.	Management strategy, ESG considerations, regulatory considerations, financial controls, liquidity, excess cash balances, additional metrics, non-wholly owned subsidaries, event risk, parental support, other institutional support, seasonality, cyclical sectors[1]
Cross-sector methodologies	Certain broad methodological considerations described in one or more cross-sector methodologies may also be relevant to ratings. If a certain ABC Corp. were domiciled in a country rated B1, the methodology that describes how we assess the impact of sovereign credit quality on other ratings may be very relevant to the assigned rating.	✗	N.A.	N.A.

[1] Examples are based on the rating methodology for the Steel industry. This provided some additional insights into the creation of a credit rating [104].

ESG Disclosure

Moody's approach to ESG integration in credit ratings focuses on assessing the materiality of ESG factors and their potential impact on an issuer's credit profile. Moody's seeks to incorporate ESG risks and benefits into its ratings in a way that reflects both current impacts and forward-looking perspectives, acknowledging that ESG considerations can vary widely in terms of materiality and time horizon. Where ESG issues are meaningful for credit profiles, Moody's incorporates them into the ratings analysis in a variety of ways in the application of the sector-specific methodologies. As one part of the overall credit analysis, ESG risks could affect the qualitative and quantitative factors and sub-factors in the relevant scorecard or model [88]. ESG impacts are incorporated, for example, in the qualitative assessment of scorecard factors such as business profile, institutional strength or regulatory environment. With sufficient visibility, ESG considerations may be incorporated into Moody's projections, or may be considered scorecard-indicated outcomes based on a variety of scenarios [88].

In evaluating ESG risks, Moody's applies a consistent framework across sectors, using Issuer Profile Scores (IPS) to measure exposure to environmental (E), social (S), and governance (G) factors on a five-point scale [88]. These scores are based on Moody's analysis of specific ESG risks and any relevant mitigants, providing a comparative view of how

ESG factors affect issuers differently within and across sectors. Additionally, Moody's may assign an ESG Credit Impact Score (CIS), which expresses the impact of ESG factors on the issuer's overall credit rating, ranging from a pronounced negative impact to a positive impact [88]. The ESG CIS is an output of the rating process that more transparently communicates the impact of ESG considerations on the rating of an issuer or transaction [88].

Environmental risks, such as carbon transition and physical climate risks, are typically assessed for their direct regulatory and physical impacts on the issuer's operations and financial health. Social factors, including demographics, labor relations, and product safety, are evaluated based on how they affect demand, compliance costs, and reputation. Governance considerations focus on the issuer's management practices, financial controls, and accountability to stakeholders. An overview of the various E, S, and G factors are provided in Table C.7.

Table C.7: ESG factors in Moody's ESG documentation for corporates [88].

Environmental Factors	*Social Factors*	*Governance Factors*
Carbon transition	Demographics	Institutional structure
Physical climate risks	Labor and income	Policy credibility and effectiveness
Water management	Education	Transparency and disclosure
Waste and pollution	Housing	Budget management
Natural capital	Health and safety	
	Access to basic services	

Example Moody's ESG Evaluation Process for Corporates: CrediQ Business S.A.

In Moody's rating action for Inversiones CrediQ Business S.A. (CrediQ), ESG factors are integrated to evaluate the company's credit profile and overall risk [105]. CrediQ is a commercial real estate data, analytics, and valuation platform designed to help unlock investment, financing, and leasing opportunities[a]. According to the press release, ESG considerations have a limited impact on the current rating with potential for greater negative impact over time because of exposures to carbon transition, shifts in societal trends and governance risks that reflect ownership concentration, organizational complexity and the region's weak regulatory framework for finance companies in the region [105]. There is nothing more mentioned about the potential consequences of this assessment.

[a] https://cred-iq.com

C.2.3 Fitch Ratings Ireland Limited (Fitch)

Fitch Ratings incorporates ESG factors into its credit analysis through ESG Relevance Scores (ESG.RS), which indicate the materiality and relevance of specific ESG elements within the existing rating framework. These scores serve as observational tools, highlighting where ESG factors impact credit assessments without directly driving rating changes.

General

Two building blocks are combined into the credit rating, which gets influenced by the specific sector of the issuer. **One** modifier.

ESG Integration

Observing relevance and materiality of ESG factors in the rating decision, but not inputs in the rating process.

Find Fitch Ratings Ireland Limited press releases for Corporates via this link.

Building Block(s) and Driver(s)

Table C.8 outlines Fitch's corporate rating methodology, focusing on the main building blocks of the BP and FP, each containing specific drivers that capture key aspects of an issuer's market and financial position. In the BP, Fitch assesses sector competitive intensity, industry profile, market position, and diversification. The financial profile includes drivers such as profitability, financial structure, and financial flexibility. Each driver in both the business and financial profiles is rated on a scale from "aa" to "ccc", providing a nuanced rating range that reflects sector-specific risks. For example, sectors with intense competition and limited growth potential may see lower ratings, while more stable sectors support higher scores. The metrics defining the scale from "aa" to "ccc" change based on the sector navigator. This structured framework enables Fitch to assess an issuer's credit profile with a comprehensive, sector-aligned approach, determining overall creditworthiness.

Table C.8: Key drivers and subfactors for the Fitch corporate methodology [89]. The subfactors are found using the sector navigator document [98]. Additional documents assessed will be referenced individually.

Building Block	*Driver*	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Business Profile (BP)[1]	Sector Competitive Intensity	Assesses the level of competition in the issuer's sector, examining barriers to entry, profit margins, and industry-specific risk factors.	✗	"aa" to "ccc"[3]	Industry structure, barriers to entry/exit, relative power in value chain
	Industry Profile	Assesses the long-term growth potential of the issuer's sector, its predictability and the susceptibility to short-term demand shocks[2]	✗	"aa" to "ccc"[3]	Long-term growth potential, volatility of demand, threat of substitutes
	Market Position	These factors indicate an issuer‘s ability to withstand competitive pressures, which can include, for example, its position in key markets, its level of product dominance, and its ability to influence price.	✗	"aa" to "ccc"[3]	Market share, competitive advantage, operating efficiency
	Diversification	Maintaining a high level of operating performance often depends on product diversity, geographical spread of sales, diversification of major customers and suppliers, and the comparative cost position.	✗	"aa" to "ccc"[3]	Geographic diversification, product/end-market
Financial Profile (FP)[1]	Profitability	Focuses on the stability of earnings and cash flows from the issuer‘s major business lines.	✗	"aa" to "ccc"[3]	EBITDA margin or EBITDAR margin, EBIT margin, FFO margin, FCF margin, volatility of profitability
	Financial Structure	Uses an array of predominantly cash-based metrics to measure the level of capitalisation of an issuer	✗	"aa" to "ccc"[3]	EBITDA leverage or EBITDAR leverage, EBITDA net leverage or EBITDAR net leverage, FFO leverage or FFO adjusted leverage, (CFO-Capex)/Debt, funding structure (LBO only)
	Financial Flexibility	Uses other flexibility measures such as liquidity and exposure to foreign-exchange movements.	✗	"aa" to "ccc"[3]	Financial discipline, liquidity, FX exposure, EBITDA interest coverage or EBITDAR fixed-charge coverage, FFO interest coverage or FFO fixed-charge cover

[1] The assessments for BP and FP drivers vary by sector and are adapted to sector-specific risk profiles.
[2] Declining industries are generally not consistent with investment-grade ratings. Sectors facing threats from substitutes with low switching costs are generally more difficult to predict.
[3] Rating scores possible: "aa", "a", "bbb", "bb", "b", "ccc".

Modifier(s)

The country risk assessment modifier, see Table C.9, include the operating environment (OE) and transfer and convertibility (T&C) risk (also called country ceiling). OE operates as an asymmetric consideration in that it will only have an impact on the issuer's rating when it is negative [89]. Country ceilings are an assessment of T&C risk, capturing the risk of the imposition of exchange controls that would prevent or materially impede the private sector's ability to convert local currency into foreign currency [89]. The navigators' sector risk profile provides a typical standalone rating range for issuers in a variety of industries. The upper boundary of the range is not a hard standalone rating cap for issuers in the industry. However, an issuer rated higher than the boundary would be expected to be a clear positive outlier on most financial and business characteristics [89].

Table C.9: Key modifiers in Fitch corporate methodology. Based on Fitch corporate methodology document [89]. Additional documents assessed will be referenced individually.

Modifier	*Driver*	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Country Risk	Operating Environment	Asymmetric consideration impacting issuer's rating when negative. A higher-risk environment can actively constrain a company's potential and overall credit profile.	✗	"aa" to "ccc"[1]	Economic environment, financial access, systematic governance
	Country Ceiling	Considers the risk of restrictions on cross-border capital flows and currency convertibility.	✗	"aa" to "ccc"[1]	T&C risk, exchange controls, currency stability

[1] Rating scores possible: "aa", "a", "bbb", "bb", "b", "ccc".

ESG Disclosure

Fitch's ESG Relevance Scores (ESG.RS) are an observational tool designed to assess the materiality and relevance of specific environmental, social, and governance (ESG) factors in credit rating decisions. These scores, ranging from 1 to 5, clarify the impact of ESG factors on Fitch's ratings. Importantly, the scores are not standalone drivers that change ratings directly but instead highlight where ESG issues play a role in the existing credit rating framework [90]. Each ESG element is scored individually, with a higher score indicating greater relevance to the rating. A score of 1 signifies that an ESG factor is irrelevant to the rating, while a score of 5 indicates a highly relevant factor with a significant impact on the credit decision [90]. This system allows Fitch to transparently show its investors and stakeholders where ESG considerations affect an issuer's credit profile under current rating criteria, without introducing new ESG-specific rating metrics. An overview of the various environmental (E), social (S), and governmental (G) factors are provided in Table C.10.

Table C.10: ESG factors in Fitch ESG Relevance Scores (ESG.RS) [90].

Environmental Factors	*Social Factors*	*Governance Factors*
GHG emissions	Human rights and community relations	Management strategy
Energy management	Customer welfare - privacy and data security	Governance structure
Water and wastewater management	Labor relations and practices	Group structure
Waste and hazardous materials management; ecological impacts	Employee wellbeing	Financial transparency
Exposure to environmental impacts	Exposure to social impacts	

Through this framework of using ESG.RS, Fitch does not judge the quality of an entity's ESG practices but instead observes and reports on how these factors affect credit risk. By disclosing ESG scores alongside credit ratings, Fitch provides a structured way for investors to assess the relevance of ESG factors, enabling more informed decisions based on how these issues influence credit outcomes.

Example Fitch ESG Evaluation Process for Corporates: Oncor Electric Delivery Company LLC

Based on the Fitch rating for Oncor Electric Delivery Company LLC[a] and its ESG Relevance Scores, here's an example of how Fitch would apply ESG considerations to the credit rating process. In recent years, Oncor has had only one wildfire incident that resulted in claims brought against it [106]. Its limited wildfire experience can be partially attributed to much of its service territory being outside of the traditional wildfire areas, newer infrastructure and wildfire mitigation planning. Oncor has benefited from best practices developed by Sempra subsidiary San Diego Gas & Electric Company (BBB+/Stable) [106]. While this ESG factor is not driving the rating independently, Fitch's analysis incorporates them as part of Oncor's credit risk profile. Environmental risks related to wildfires, is observed under the ESG Relevance Scores. However, since these factors do not materially affect the core financial metrics or the issuer's ability to meet its obligations, their impact remains limited, hence a ESG.RS score of '3' is given [106]. Fitch's rating process is transparent about these observations, allowing stakeholders to understand that ESG factors are considered in the overall assessment but are not currently a key driver in Oncor's 'A' rating for its senior secured notes or its 'BBB+' Long-Term Issuer Default Rating [106].

[a] https://theclimateregistry.org/members/oncor-electric-delivery-company-llc/

C.2.4 DBRS Rating GmbH (DBRS)

DBRS integrates ESG factors both qualitatively and quantitatively, incorporating them into the building blocks based on sector-wide ESG relevance and issuer-specific ESG impacts. Adjustments are made where ESG factors materially affect the credit profile, potentially leading to changes in the overall rating. There is not that much in-depth information how the ESG factors affect the credit rating.

General

Two building blocks are combined, adjusted by modifiers and other criteria[3].

ESG Integration

ESG factors are both **implicitly** and **explicitly** included in the rating process.

Find DBRS Rating GmbH press releases for Corporates via this link.

Building Block(s) and Driver(s)

The credit rating process is structured around two primary building blocks, the BRA and FRA (see Table C.11). These building blocks form the foundation of the issuer's credit evaluation, each focusing on distinct aspects of the issuer's profile [94].

The BRA evaluates the major business risks of an issuer, incorporating factors specific to the industry. The BRA framework typically identifies three to five key drivers to determine the overall business risk [94]. These drivers include industry position, which reflects the issuer's competitive standing within its sector; revenue stability, assessing the predictability and consistency of income streams; operational diversity, examining the range of products, services, or geographic reach; market dynamics, capturing broader industry trends and competition; and regulatory impact, which considers the influence of legal and compliance factors. These subfactors collectively give a comprehensive view of the issuer's operating environment and potential vulnerabilities. Importantly, ESG considerations can also affect the BRA when they impact these core business risk factors [94].

The FRA focuses on the financial health and resilience of the issuer, using a variety of metrics to assess financial soundness. Key FRA drivers include liquidity, which measures the issuer's ability to meet short-term obligations; profitability, evaluating the efficiency of operations in generating earnings; and leverage ratios (such as Debt/EBITDA), which indicate the extent of financial indebtedness. Additional metrics like cash flow metrics (CFO/debt, FFO/debt) and capital structure provide further insights into financial stability and capital management. The FRA helps DBRS understand the issuer's ability to withstand financial stress and meet long-term obligations [94]. Like the BRA, the FRA can be affected by ESG factors, particularly when they influence financial performance or stability, ensuring that relevant ESG impacts are factored into the financial assessment.

Together, the BRA and FRA provide a comprehensive assessment of an issuer's business and financial risk profiles, with the flexibility to integrate ESG factors where they materially impact the issuer's credit profile [94]. This structured approach allows DBRS to account

[3]Depending on the instrument, "other criteria" may include certain sections that address recovery or hybrids/preferred shares, for example. Please refer to the section below entitled rating the specific instrument and other criteria for a discussion of criteria that may be applicable at any stage of the credit rating process [94].

for both operational and financial dimensions of credit risk, supporting a nuanced and realistic rating outcome.

Table C.11: Key drivers and subfactors in BRA and FRA building blocks for the DBRS corporate methodology [94].

Building Block	*Driver*	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Business Risk Assessment (BRA)	BRA factors	Major business risks assessed through factors in the industry-specific BRA grid. Typically, three to five key factors drive the BRA determination.	✓	N.A.	Industry position, revenue stability, operational diversity, market dynamics, and regulatory impact
Financial Risk Assessment (FRA)	FRA metrics	The FRA pertains to financial soundness and is determined by assessing each of the FRA factors.	✓	N.A.	Liquidity, profitability, leverage ratios (e.g., Debt/EBITDA), cash flow metrics (CFO/debt, FFO/debt), and capital structure

[1] Financial metrics and expectations may vary by sector and region, influencing both BRA and FRA indirectly.

Modifier(s)

Various modifiers are incorporated to refine the credit assessment of an issuer by addressing factors beyond the core BBRA and FRA building blocks, as can be derived from Table C.12. These modifiers enable DBRS to adjust the credit rating based on external elements that might impact creditworthiness but are not fully captured within the BRA/FRA framework. The adjustments are typically applied to key FRA metrics, such as cash flow-to-debt, debt-to-EBITDA, and EBITDA-to-interest ratios, which DBRS considers crucial in assessing the financial risk profile of an issuer (as detailed in DBRS's corporate methodologies)[107]. These adjustments may be applicable across various industries or, in some cases, specific to certain sectors, and are not intended as judgments on the adequacy of accounting rules or practices[107].

Strategic advantages or impediments not otherwise captured by BRA factors may include an exceptional brand, a unique product or process or unusually large or small operations [94]. The parent-subsidiary relationship modifier assesses the effect of the corporate structure, particularly when the issuer is part of a broader group. Structural subordination, financial interdependence, or implicit support from a strong parent company may alter the credit profile by providing additional support or risks. [94]. Other financial considerations capture financial risks not directly reflected in BRA/FRA metrics, including liquidity position, cash flow volatility, pension liabilities, or weak financial policies, which offer a fuller perspective on the issuer's financial resilience [94]. The ESG considerations modifier integrates ESG factors into the rating when these issues have a material effect on the issuer's credit profile. Where an ESG factor is material to a corporate rating, but is not otherwise addressed in a BRA/FRA factor or other overlay, DBRS will reflect the impact of the ESG factor on the rating through this general ESG overlay [94]. The sovereign risk modifier evaluates the influence of a country's credit quality on the issuer, particularly when the issuer operates predominantly in lower-rated countries or has substantial exposure to such markets. Sovereign risk, narrowly defined, captures the likelihood of a government failing

to meet its debt obligations to private sector entities [108]. DBRS may adjust an issuer's rating if it operates in a region where economic or political instability introduces additional risks to credit stability.

Table C.12: Key modifiers in DBRS' corporate methodology [94].

Modifier	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Strategic advantage or impediment	Strategic advantages or impediments not otherwise captured by BRA factors may include an exceptional brand, a unique product or process or unusually large or small operations.	✗	N.A.	Brand reputation, unique product offerings, operational scale
Parent-subsidiary relationship	May include the potential presence of structural subordination when the issuer is a holding company or the possibility of implicit support from a strong parent when the issuer is an important subsidiary of a broader corporate group.	✗	N.A.	Structural subordination, implicit support, financial interdependence
Other financial considerations	May include (but not limited to) additional financial risk factors not directly captured by the core BRA/FRA, such as liquidity position, cash flow stability, weak financial policies, or unusual liabilities that may impact creditworthiness.	✗	N.A.	Liquidity, cash flow volatility, uncertainty in issuer's financial outlook owing, pension liabilities, weak financial policies
ESG considerations	Reflects the impact of environmental, social, and governance factors on the issuer's rating, which are material if they aren't captured within the BRA/FRA or other overlays. The impact of ESG factors may vary across industries, sectors, or asset classes.	✓	N.A.	Environmental impact, governance practices, social responsibility
Sovereign risk	The issuer rating may, in some cases, be constrained by the credit quality of a sovereign. If the issuer operates in a lower-rated country or operates in multiple countries but a material amount of its business is conducted in that lower-rated country, DBRS may reflect this risk by lowering the issuer rating.	✗	N.A.	Country risk, macroeconomic risk, sovereign risk

ESG Disclosure

DBRS incorporates ESG factors implicitly within BRA and FRA factors, and where material, through a dedicated ESG overlay [94]. This overlay captures additional ESG risks or opportunities that impact a company's credit profile, allowing DBRS to reflect significant ESG-related credit risks that may not be fully integrated within the core rating assessments. This provides a comprehensive view of ESG impacts on creditworthiness across industries and asset classes. DBRS assesses the relevance of these ESG factors by asking targeted questions[4] to determine their impact on the issuer. If one of these questions could

[4]Questions are answered such as: "Does factor affect brand strength or reputation?", "Does factor affect risk profile?", and "Does factor affect earnings or cash flow?" [95].

be answered with a "Yes", this could mean that BRA/FRA may be adjusted or an overlay is added, with a potential rating effects as a result [95]. These adjustments ensure that the potential influence of significant ESG factors is integrated into the overall assessment of the issuer's creditworthiness.

Environmental factors include aspects like emissions, effluents, waste, carbon and GHG costs, resource and energy management, land impact, biodiversity, and climate and weather risks (see Table C.13) [95]. Social factors cover the social impact of products and services, human capital and human rights, product governance, data privacy and security, occupational health and safety, community relations, and access to basic services [95]. Governance factors, on the other hand, focus on risks related to bribery, corruption, political risks, business ethics, and corporate or transaction governance [95].

For instances where ESG factors do not significantly influence brand strength, risk profile, or financial performance, they are not factored into the rating. This selective approach allows DBRS to focus on material ESG factors that are likely to impact the issuer's credit profile, ensuring that the ratings reflect a comprehensive and realistic view of potential risks and strengths. According to DBRS, all ESG factors are generally consistent with those that global ESG stakeholders use to assess ESG factors for sustainable investing and financial risks [95].

Table C.13: ESG factors in DBRS credit rating framework [95].

Environmental Factors	*Social Factors*	*Governance Factors*
Emissions, Effluents, and Waste (G/F/C/S)	Social Impact of Products and Services (F/C/S)	Bribery, Corruption, and Political Risks (G/F/C)
Carbon and Greenhouse Gas (GHG) Costs (G/F/C/S)	Human Capital and Human Rights (G/F/C/S)	Business Ethics (F/C)
Resource and Energy Management (G/C)	Product Governance (F/C/S)	Corporate/Transaction Governance (F/C/S)
Land Impact and Biodiversity (G/F/C)	Data Privacy and Security (F/C/S)	Institutional Strength, Governance, and Transparency (G)
Climate and Weather Risks (G/F/C/S)	Occupational Health and Safety (C)	Peace and Security (G)
	Community Relations (F/C)	
	Access to Basic Services (G/F/C)	

Example DBRS ESG Evaluation Process for Corporates: Canadian Natural Resources Limited

DBRS made a press release mentioning that it placed Canadian Natural Resources Limited (CNRL)[a] under review with Negative Implications following the announcement of a major acquisition of Chevron Canada Limited's Alberta assets. This acquisition would increase CNRL's debt load by approximately 80%, raising concerns about the company's future credit profile given future uncertainty in energy prices [109]. From an ESG perspective, DBRS specifically highlighted environmental risks as part of its credit analysis for CNRL. Within DBRS's framework, the environmental (E) factor considers both physical and transition risks associated with climate change, with a particular focus on transition risks due to increasingly stringent environmental regulations in Canada aimed at reducing greenhouse gas (GHG) emissions [109]. For CNRL, these transition risks are highly relevant due to the company's significant exposure to carbon-intensive oil sands operations, which are subject to additional regulatory scrutiny and potential cost increases as the Canadian government pushes for lower emissions across the energy sector [109]. DBRS notes that no specific social or governance factors had a significant or relevant effect on the credit analysis for this acquisition.

[a] https://www.cnrl.com

C.2.5 Scope Ratings (Scope)

Scope integrates ESG factors qualitatively within its rating framework, evaluating their direct and indirect impacts on the business and financial risk profiles. ESG factors are assessed based on their material relevance to credit quality, with no explicit numerical adjustments disclosed.

General	ESG Integration
Two building blocks are combined, which gets adjusted by **four** modifiers.	ESG factors are both **implicitly** and **explicitly** included in the rating process.

Find Scope Ratings press releases for Corporates via this link.

Building Block(s) and Driver(s)

Table C.14 outlines the core drivers and subfactors within the BRP and FRP in Scope Ratings' corporate methodology. The BRP is a fundamental component that assesses the overall business environment in which a company operates, focusing on industry risk and competitive positioning. This includes cyclicality, entry barriers, and substitution risks [93]. All these three industry drivers are classified as either high, medium or low risk [93]. Competitive positioning, a key component of BRP, considers a company's market share, product or geographical diversification, and operational profitability as fundamental indicators of resilience within its sector. By measuring these factors, Scope determines the

issuer's long-term viability in sustaining revenues and competing effectively in its market. These factors collectively determine the long-term stability and resilience of a company within its industry. Competitive positioning factors represent the benchmarks for the rated company in its underlying industry [93]. This driver considers elements like market share, product or geographic diversification, and profitability metrics, which can offer insights into how well-positioned the company is to manage operational challenges and leverage opportunities within its sector.

The FRP evaluates a company's financial health and resilience, primarily through leverage, interest cover, and cash flow cover. The leverage driver looks at the company's debt management relative to its cash flow, assessing its ability to service its debt obligations effectively. Key subfactors include debt-to-EBITDA and FFO-to-debt ratios, which are essential in understanding a company's debt sustainability. Interest cover assesses the company's ability to meet interest obligations with its earnings, a critical measure for determining credit risk and financial stability. High interest coverage indicates a solid earnings cushion against debt costs, while low coverage can signify financial strain. Cash flow cover focuses on liquidity, evaluating the generation of free operating cash flow (FOCF) against debt. This driver is crucial for understanding whether a company has sufficient internal resources to manage financial commitments without external funding.

Table C.14: Key drivers and subfactors in BRP and FRP building blocks for Scope Ratings corporate methodology. Derived from Scope Ratings corporate methodology documents [93].

Building Block	*Driver*	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Business Risk Profile (BRP)	Industry risk	Evaluates the risks associated with industry dynamics, including cyclicality, entry barriers, and substitution risks. Industry risk combines these aspects to assign an overall risk rating.	✓	High, medium, low	Cyclicality (revenue volatility, GDP linkage), entry barriers (capital requirements, regulation), substitution risks (technological obsolescence, structural shifts)
	Competitive positioning	Assesses company-specific factors that indicate its ability to compete within the industry. Factors like market shares, diversification, and profitability influence the overall competitive stance of the company.	✓	N.A.	Market share, diversification (products, geographies, suppliers), operating profitability (margins, volatility), sector-specific factors (R&D, sales productivity)
Financial Risk Profile (FRP)	Leverage	Assesses an issuer's capacity to manage debt in relation to cash flow, including ongoing obligations and debt service capabilities.	✓	AA and above to CCC and below	Core ratios (Scope-adjusted debt/EBITDA, FFO/debt), supplementary metrics
	Interest cover	Reflects the issuer's ability to cover interest payments from operating earnings. Interest cover is assessed in the context of EBITDA and overall indebtedness.	✓	AA and above to CCC and below	Core ratio (EBITDA/interest), supplementary ratio in context of leverage and cash flow cover
	Cash flow cover	Evaluates cash flow generation against debt, focusing on free operating cash flow (FOCF) as an indicator of liquidity and debt coverage.	✓	AA and above to CCC and below	Free cash flow ratios, supplementary liquidity considerations

Modifier(s)

Table C.15: Key modifiers in Scope Ratings corporate methodology. Based on Scope Ratings corporate methodology documents [93].

Modifier	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Financial policy	Reflects the management's risk appetite for discretionary spending and the alignment of financial strategies with long-term credit stability. Higher ratings can reflect conservative management practices, while lower ratings may indicate aggressive spending.	✓	Positive, neutral, negative	Discretionary spending (acquisitions, buybacks), credit level commitment, leverage tolerance
Parent / government support	Evaluates the potential impact of ownership support or restrictions, especially if the parent company or government has an influence on the rated entity's credit profile. Considerations include explicit guarantees or implicit support through shared resources.	✓	Significant, moderate, limited	Explicit guarantees, financial support, name equality, shared treasury operations
Peer context	Positions an issuer's credit profile relative to industry peers by considering industry-specific risks, credit trends, and operational volatility. Helps to adjust the rating based on competitive and environmental factors.	✓	Positive, neutral, negative	Market position, industry volatility, emerging market risks, operational environment
Governance and structure	Assesses the issuer's adherence to corporate governance standards, transparency, and control structures. High ratings reflect strong governance practices, while low ratings may indicate governance weaknesses that could affect credit stability.	✓	Positive, neutral, negative	Ownership structure, board effectiveness, risk management practices, internal controls

ESG Disclosure

Scope Ratings incorporates ESG factors into its credit rating methodology. ESG-related rating factors can directly or indirectly affect all key rating factors that make up our assessment of an issuer's BRP, FRP and supplementary rating drivers [93]. The credit rating methodologies vary according to the asset class, industry or region as well as the capital and structural features of a financial instrument [100]. Similarly, the assessment and the relevance of ESG factors is a function of the asset class, the industry or the region in question [100]. ESG factors need to be continuously monitored to determine their materiality and their impact on the financial performance, and hence the credit quality of an entity or a financial instrument [100].

In the BRP, Scope considers how ESG-related risks impact an issuer's industry and competitive positioning. For instance, environmental and social trends may intensify cyclicality and substitution risks or affect industry entry barriers, particularly for industries facing significant regulatory pressures, like energy or automotive. Similarly, a company's approach to ESG can shape its competitive position [100]. The FRP also includes ESG influences, such as liquidity assessments [93]. Companies investing heavily in ESG-compliant practices, such as sustainable infrastructure or greener supply chains, may see immediate

cash flow impacts, though these investments could mitigate future regulatory costs or environmental risks. Similarly, debt metrics may reflect ESG-related investments; Scope considers how these affect the issuer's ability to manage debt relative to cash flow, with attention to the potential for long-term credit stability.

Governance is a particularly emphasized ESG factor, viewed as essential for consistent credit performance. Governance considerations have been among the most long-standing and prominent credit rating drivers that are part of all credit rating methodologies [100]. Governance factors indicate how well a corporation is controlled and directed and the extent to which the interests of different stakeholders are safeguarded, including the capacity and willingness of an entity to honour its obligations on time and in full [100]. Effective governance practices are seen as a credit-positive factor, particularly where they bolster oversight and stakeholder alignment.

Scope's reports typically highlight specific ESG considerations within these broader risk profiles, offering transparency on how ESG factors influence an issuer's creditworthiness. By adjusting its methodologies to reflect ESG standards, Scope ensures its ratings keep pace with evolving regulatory frameworks and market expectations. This approach enables Scope to account for both the risks and opportunities arising from ESG trends, fitting these considerations to each issuer's unique context.

Example Scope ESG Evaluation Process for Corporates: INDIS Malta Ltd.

Scope's integration of ESG factors into INDIS Malta's credit rating reflects its broader ESG methodology, which evaluates the material impact of environmental, social, and governance elements on credit quality. ESG factors "are captured by Scope's rating approach through several analytical areas," specifically assessing their relevance to both business and financial risks. For INDIS Malta, Scope's A+ rating incorporates ESG considerations through a 25% weighting, as per its 'Sovereign Ratings' methodology applied to the Republic of Malta, INDIS's public sponsor [110]. In environmental terms, Scope highlights INDIS Malta's contributions to Malta's transition towards a lower-carbon economy, noting that "INDIS Malta is playing an increasingly important role in supporting the environmental transition of the country via the implementation of climate mitigation policies and the rehabilitation of disused land" [110]. Governance is equally pivotal, as Scope assesses the "high" degree of government oversight in INDIS Malta's operations, as they have substantial financial ties to the government of the Republic of Malta through a full public ownership [110]. credit stability through strong operational control and oversight.

C.2.6 EthiFinance Ratings (EthiFinance)

EthiFinance integrates ESG factors both qualitatively and quantitatively, adjusting industry risk profiles and financial risk assessments based on sector-wide ESG scores and company-specific ESG performance. Adjustments may lead to notching changes in the overall rating.

General

Two building blocks are combined, which gets adjusted by **three** modifiers.

ESG Integration

ESG factors are included **implicitly** in drivers and **explicitly** as a modifier.

Find EthiFinance Ratings press releases for Corporates via this link.

Building Block(s) and Driver(s)

Table C.16 outlines the core elements EthiFinance Ratings uses to assess a company's creditworthiness, splitting the analysis into two major building blocks: the BP and FP. The industry risk profile, which constitutes 40% of the BP, assesses the sector's competitive intensity, barriers to entry, and profitability, incorporating indicators like EBIT margins, peak-to-trough volatility, and growth potential [96]. ESG sector risks are also factored in, as industries with significant environmental or social risks may receive adjusted scores [96]. Competitive positioning, another 40% of BP, evaluates a company's market standing by examining scale, geographic reach, and brand strength. Companies with strong competitive advantages, including market positioning and diversification, tend to display greater resilience. The final BP component, governance, assesses management quality, financial policy, and shareholding structure, weighing 20% of BP. Effective governance structures support stability and risk management, while weaker governance could increase a company's vulnerability to financial challenges [96].

The FP block measures financial health with a strong focus on cash flow and leverage capacity. Cash flow and leverage, the main driver making up 80% of FP, assesses debt-servicing capabilities and sustainable leverage through key ratios like Net Debt/EBITDA, FFO/Net Debt, and EBITDA/interest. Capitalization, comprising the remaining 20% of FP, focuses on equity-to-debt ratios, capturing the company's stability in handling financial fluctuations. Together, these building blocks allow EthiFinance to provide a comprehensive assessment of both the operational and financial dimensions of a company, offering an in-depth basis for determining corporate credit ratings.

Table C.16: Key drivers and subfactors in EthiFinance corporate methodology. Information derived from EthiFinance corporate rating methodology [96].

Building Block	*Driver*	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Business Profile (BP)	Industry risk profile	Assesses the overall industry risk characteristics, including competitive environment, barriers to entry, and profitability. Weights industry risk as 40% of BP[1]	✓	1 (least risky) to 7 (most risky)	Levels of profitability (EBIT margins), volatility of profitability (peak-to-trough), effectiveness of barriers to entry, growth perspectives, ESG sector risks and opportunities[2]
	Competitive positioning	Evaluates the company's position relative to sector peers based on factors such as scale, geographic reach, and brand. Weights competitive positioning as 40% of BP[1]	✓	1 (least risky) to 7 (most risky)	Scale, competitive advantage, diversification (geographic, client, and product). ESG impact on company position.
	Governance	Governance assesses the quality of management and shareholding structure, reflecting on management quality, shareholder support, and risk tolerance. Governance constitutes 20% of BP[1]	✓	1 (least risky) to 7 (most risky)	Financial policy/management quality, shareholding and control structure.
Financial Profile (FP)	Cash flow and leverage	Assesses a firm's debt servicing capacity and leverage based on core metrics such as Net Debt/EBITDA. This driver constitutes 80% of FP[1]	✓	1 to 7	Net Debt/EBITDA, Funds From Operations (FFO)/Net Debt, EBITDA/interest.
	Capitalisation	Evaluates the equity-to-debt ratio, reflecting on the stability of the firm's capital structure. Capitalization is 20% of FP[1]	✓	1 (least risky) to 7 (most risky)	Equity/Debt ratios.

[1] Important to note is that the weights are doubled compared to the weights found in Table 2 of the *EthiFinance Corporate Methodology* [96]. Reasoning is that the focus there is on a total 100% of BP and FRP together, while this overview tries to show the respective driver weights per building block.
[2] Industry risk scores are adjusted based on sector-level ESG exposure within a range of [-1, 1] notches.

Modifier(s)

Table C.17 presents additional factors (modifiers) that EthiFinance Ratings employs to fine-tune a corporate credit rating, accounting for situational nuances not fully captured by traditional business and financial assessments. These modifiers, liquidity risk, country risks, and ESG controversies, allow EthiFinance to make adjustments reflecting a company's unique circumstances.

Liquidity risk, for instance, evaluates a company's ability to meet short-term financial obligations by examining sources of funds such as unrestricted cash, projected operating cash flows, and undrawn credit facilities, alongside uses like upcoming debt maturities and capital expenditures. A high liquidity level indicates a robust position with a strong refinancing profile signaling resilience against financial pressures. Country risks further adjust ratings by assessing exposure to geopolitical, macroeconomic, fiscal, and regulatory environments. EthiFinance draws on third-party assessments and considers factors such as the stability of property rights, fiscal policy, and political environment [96]. Firms operating in stable regions may benefit from favorable adjustments, while those in riskier jurisdictions might face rating penalties to reflect heightened uncertainties [96]. The ESG controversies modifier addresses the alignment between a company's ESG commitments and actual practices. By measuring the potential for financial, reputational, or legal repercussions from controversies, this modifier ensures that companies with serious ESG-related issues are appropriately rated. Scores range from minor concerns to severe impacts, with a high score potentially leading to a one- or two-notch downgrade, underscoring the impact of consistent and responsible ESG practices on credit stability [96].

Table C.17: Key modifiers in EthiFinance corporate methodology. Based on EthiFinance corporate methodology document [96].

Modifier	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Liquidity risk	Evaluates a firm's liquidity by reviewing sources and uses of funds, including unrestricted cash, projected cash flow, and available credit lines, along with uses like debt maturities and capital spending.	✗	Very Weak, Weak, Good	Level of liquidity (e.g., liquidity >2 years is high, <1 year is poor), refinancing profile (weak, satisfactory, or strong).
Country risks	Assesses macroeconomic, political, fiscal, and regulatory risks within the countries where the firm operates, impacting overall credit stability.	✗	Adjusted based on country risk	Transfer risk, legal and regulatory stability, property rights, financial distress laws, political environment.
ESG controversies	Measures alignment between a company's ESG communications and actions. Higher controversy scores reflect significant impacts on financial, reputational, or legal standings.	✓	1 (minor issues) to 5 (severe impact)	Controversy score affects rating by 1 or 2 notches depending on severity, with higher scores leading to greater downgrades.

ESG Disclosure

In EthiFinance's methodology, ESG factors are systematically integrated (implicitly and explicitly) at both the industry and company levels to provide a comprehensive view of how these elements impact a company's creditworthiness. This could be derived from the fact that ESG is found in both Table C.16 (implicit ESG through drivers) and Table C.17 (explicit ESG controversy modifier).

Industry-wide ESG risks are assessed through a sector heatmap that evaluates each industry's financial materiality (how ESG factors affect financial performance) and non-financial materiality (the sector's impact on society and the environment) [96]. This

heatmap[5] results in an ESG sector score, ranging from 1 to 5, with higher scores indicating more significant ESG challenges. Based on this score, EthiFinance may adjust the industry risk profile by up to one notch, positively or negatively, to reflect the inherent ESG exposure of the sector. At the company level, EthiFinance uses an ESG scorecard with 18 indicators to evaluate a company's individual ESG practices. This score can lead to a one-notch adjustment (up or down) in the company's FP, accounting for the potential impact of ESG practices on financial stability. This adjustment reflects EthiFinance's consideration of a company's capacity to manage ESG risks effectively. Additionally, EthiFinance monitors ESG controversies to gauge alignment between a company's stated commitments and actual behavior. Controversies are rated on a scale from 1 (minor issues) to 5 (severe impact), with high scores potentially leading to one- or two-notch downgrades. Through this integrated approach, EthiFinance reflects both the broader ESG challenges of the sector and the company-specific ESG factors, providing a nuanced rating that aligns with responsible business practices.

Example EthiFinance ESG Evaluation Process for Corporates: Avril Group

Avril Group is a large French private group specializing in the industrial processing and transformation of oilseed grains into oils and proteins (crushing, refining, etc.) for various applications such as biodiesel, edible oils, and oleochemicals [111]. EthiFinance identifies Avril Group as having medium-to-high ESG risks due to its environmental impact through its heatmap score assessment [111]. This sector receives an ESG sector score that slightly constrains the industry risk assessment (which would impact the BP). If the company demonstrates strong ESG practices, such as sustainable sourcing and robust environmental management systems, its individual ESG score may positively influence its financial assessment (company ESG score of between 0 and 1), potentially offsetting some of the sector's inherent risks [111]. Through this comprehensive integration of ESG factors, EthiFinance provides a nuanced assessment of a company's creditworthiness, reflecting both industry-wide ESG challenges and the company's specific ESG performance.

C.2.7 HR Ratings de Mexico, S.A. de C.V. (HR)

HR Ratings integrates ESG factors through a qualitative adjustment process that can influence corporate credit ratings by up to three notches, reflecting material impacts on financial stability specific to each industry. However, rating reports are in Spanish.

General

Focuses on quantitative analysis as the **one** building block, adjusted by **two** qualitative factors (general and ESG).

ESG Integration

ESG factors are **explicitly** included in the rating process.

[5] Consisting of an environmental analysis of climate, resources, pollution, and biodiversity. It also incorporates stakeholders: suppliers, consumers, state, regions, communities, and global risk [96].

Find HR Ratings de Mexico, S.A. de C.V. press releases for Corporates via this link.

Building Block(s) and Driver(s)

The HR methodology has one building block based on the quantitative analysis conducted, and has two modifiers: general or based on ESG. The quantitative rating is based on four financial metrics for corporate debt, three of which are also used for dependent structured debt [91]. Metrics are constructed on a corporate fiscal year basis. When there are three quarters of information reported in the current fiscal year, that year is considered a historical year, projecting the last quarter. The annual weights decrease as the distance between the projected, or historical, year and the current year increases [91]. Once the projections for the two scenarios have been developed, the weighted average of the the five annual metric values (reported and projected) is calculated. This is done for each of the four metrics and for each scenario. Each of these weighted average annual metric values are then converted into standardized (across all four metrics) numerical ratings, which can be seen in Table C.18 using the scale. Subsequently, the weighted average of the four (or three for structured debt) standardized numerical metric ratings is calculated for each scenario, where extended information about the formulas and weights are given in Table C.19. Finally, the weighted average of the ratings of the two scenarios is calculated [91].

Table C.18: Key drivers and subfactors in HR Ratings de Mexico's corporate methodology. Mostly based on HR Ratings de Mexico corporate methodology document [91]. Other documents assessed will be referenced individually.

Building Block	*Driver*	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Quantitative Analysis	Debt Service Coverage Ratio (DSCR)	Accounts for 20% of the quantitative credit rating. The DSCR calculation involves Free Cash Flow (FCF) and Debt Service for the fiscal year.	✗	1 (lowest) to 19 (highest)[1]	Free Cash Flow (FCF) for fiscal year, Debt Service for fiscal year
	DSCR + Available Cash	Adds available cash at the end of the previous period to the year's estimated FCF for DSCR calculation. Relevant for corporations with significant cash amounts.	✗	1 (lowest) to 19 (highest)[2]	Free Cash Flow (FCF) for fiscal year + Available Cash, Debt Service for fiscal year
	Years to Payment Ratio	Measures long-term viability by assessing net debt at the end of the fiscal year against FCF, indicating the entity's repayment capability.	✗	1 (lowest) to 19 (highest)[3]	Net Debt at end of fiscal year, Free Cash Flow (FCF) for fiscal year
	Marketable Assets to Total Liabilities	Measures asset liquidity by comparing the market value estimate of assets to total liabilities.	✗	1 (lowest) to 19 (highest)[4]	Market Value Estimate for Assets, Total Liabilities at end of fiscal year

[1] Specific rating range from 0 (HR C) to 2.29 (HR AAA).
[2] Specific rating range from 0 (HR C) to 4.25 (HR AAA).
[3] Specific rating range from 0 (HR AAA) to 21 (HR C).
[4] Specific rating range from 0 (HR C) to 1.65 (HR AAA).

Table C.19: Additional information for the corporate debt ratios for base and stress scenarios used in the quantitative analysis building block [91].

Driver	**Formula**	**Weight**
DSCR	$\frac{\text{Free Cash Flow for fiscal year}}{\text{Debt Service for fiscal year}}$	20.0%
DSCR + Available Cash	$\frac{\text{FCF for the fiscal year + Available Cash}}{\text{Debt Service for the fiscal year}}$	20.0%
Years to Payment Ratio	$\frac{\text{Net Debt at end of fiscal year}}{\text{Free Cash Flow for fiscal year}}$	40.0%
Marketable Assets	$\frac{\text{Market Value Estimate for Assets at end of fiscal year}}{\text{Total Liabilities at end of fiscal year}}$	20.0%

Modifier(s)

Once the quantitative analysis is completed, the results are used to derive an anchor credit rating. After this, qualitative adjustments are applied [91]. These adjustments can positively or negatively affect the anchor rating, depending on the specific risks and opportunities identified. Adjustments are particularly relevant for debt structures, corporate groups, or companies with significant minority interests. The general qualitative adjustments include a variety of concepts [91]. For example, adjustments for instruments with different

payment priority in a non-default context, the risks associated with a concentration of customers or suppliers, and possible changes to the metrics during or after the quantitative rating period ends. It is also important to evaluate the dependent structured debt and the corporations that generate the assigned income. In both cases, the projections after the ordinary rating period are intended to determine the expected trend in the metrics [91].

Table C.20: Key modifiers in HR Ratings de Mexico's corporate methodology [91].

Modifier	*Description*	*ESG-affected?*	*Scale*	*Subfactors*
Qualitative Adjustments	Qualitative adjustments based on factors like financial support from a parent group, senior or subordinated debt, customer/supplier concentration, market position, or other financial risks not reflected in quantitative metrics. Adjustments may be positive or negative depending on specific conditions.	✗	One or more negative (or positive) notches if necessary	N.A.
ESG Adjustments	HR Ratings evaluates seven ESG factors for private and public entities. The materiality of each factor is categorized as moderate or high, with weights assigned based on exposure and mitigation assessments. Private entities are evaluated for ESG impact using a tree-based approach, considering exposure and mitigation levels for environmental, social, and governance factors.	✓	Superior, average, limited. Up to three notches of adjustment	Not all entities are exposed to the same ESG risks; therefore, the analysis of HR Ratings focuses on identifying these risks and considers the extent to which the entity is capable of mitigating and/or managing them, this refers to the materiality of an ESG factor or risk for a corporate entity that carries out its activities in a specific industry or line of business.

ESG Disclosure

Within HR Ratings' corporate credit rating framework, ESG factors are evaluated primarily based on their material impact on the creditworthiness of an entity, specifically in terms of its ability to meet debt obligations [91]. These factors are categorized under environmental, social, and governance sections, where each category is assessed through specific factors and applied across various industries[6].

ESG analysis in HR Ratings' methodology is both qualitative and quantitative, enabling an entity's credit rating to be adjusted by up to three notches. Adjustments consider the materiality of specific ESG risks that might impact financial performance over

[6]The HR Ratings ESG methodology evaluates ESG factors across various sectors, including food and beverage, service industries, extractive and mineral processing, construction and public services, manufacturing and transformation, consumer goods, and green technologies [91]. This sector-specific approach allows HR Ratings to integrate industry-relevant ESG risks and opportunities into the credit rating process when they materially impact financial stability.

the medium and long term. This assessment identifies each entity's exposure to relevant ESG factors and evaluates its ability to adapt to or mitigate these risks. The rating process uses a labeling system, with labels like "Superior," "Average," and "Limited" to reflect an entity's risk exposure and mitigation capabilities in relation to each ESG component. A combination of "Superior" labels generally supports a positive rating adjustment, whereas "Limited" labels may result in a negative adjustment [91]. Table C.21 shows the environmental, social, and governmental factors taken into account within the methodology of HR. To understand what all these factors incorporate as their subfactors, see Chapter 5 of the *HR Corporate Methodology*[7] [91].

Table C.21: ESG factors considered in HR Ratings de Mexico's credit rating framework [91].

Environmental Factors	*Social Factors*	*Governance Factors*
Corporate environmental policies and approach	Social business approach	Internal regulations and integrity policies
Exposure to environmental phenomena and regulation	Human capital	Quality of management and senior leadership
		Operational and technological risks
		Regulatory framework risks and macroeconomic risks
		Transparency and history of non-compliance

C.3 Recommendations for ESG Incorporation

Table C.22: CSRD factors and respective ESG integration recommendations for IRB models.

CSRD Factor	**Costs Related to CSRD (from CRA)**	**Data Required (from Corporate)**	**Integration Potential (IRB Model)**	**Recommendations**

[7] https://www.hrratings.com/docs/metodologia/Corporates_2024.pdf

Climate Change (E1)	Carbon pricing costs, transition costs for low-GHG operations, stranded asset risks.	Greenhouse gas emissions (Scope 1, 2, potentially 3), energy consumption metrics, asset valuation data.	Driver: Impacts revenue stability, operating costs, and cash flow. Modifier: Consider ESG transition readiness.	1. Integrate as a driver under 'Cash Flow/Leverage' (S&P). 2. Use as a modifier under 'Other Considerations' (Moody's). 3. Include in ESG overlays for high-carbon industries (DBRS).
Pollution (E2)	Waste and pollution mitigation costs.	Waste generation and treatment data.	Driver: Reflects operational efficiency.	1. Add as a driver under 'Profitability' (S&P). 2. Use as an ESG modifier for sectors with significant regulatory exposure (Scope). 3. Adjust through industry-specific ESG overlays (DBRS).
Water and Marine Resources (E3)	Water usage and regulatory compliance costs.	Water consumption and wastewater metrics.	Modifier: Regional or sector-specific impact on operational sustainability.	1. Adjust ratings for water-intensive industries under 'Industry Risk' (S&P). 2. Apply water metrics as part of ESG overlays (DBRS). 3. Use as qualitative modifiers for water-intensive regions (Moody's).
Biodiversity and Ecosystems (E4)	Costs of conservation or restoration initiatives.	Land use and biodiversity impact assessments.	Modifier: Impacts long-term operational viability in certain industries.	1. Incorporate biodiversity risks into qualitative modifiers (Moody's, Scope). 2. Add biodiversity as part of sector-specific ESG overlays (DBRS). 3. Include biodiversity in competitive positioning evaluations (EthiFinance).
Resource Use & Circular Economy (E5)	Inefficiencies in material use and recycling.	Resource efficiency metrics.	Driver: Influences operational efficiency and cost.	1. Evaluate circular economy adoption under operational efficiency (S&P, Fitch). 2. Adjust ratings for industries with significant material inefficiencies (Scope). 3. Reflect circular practices through ESG overlays for waste-heavy sectors (DBRS).

Own Workforce (S1)	Health and safety compliance costs, turnover and retention costs.	Accident frequency, absenteeism rates, turnover data.	Modifier: Reflects workforce stability and productivity.	1. Integrate workforce safety as a qualitative modifier under 'Governance' (S&P, Scope). 2. Reflect turnover and absenteeism metrics in 'Profitability and Efficiency' (Fitch). 3. Include health and safety impacts as ESG overlays for labor-intensive sectors (DBRS).
Workers in the Value Chain (S2)	Fair labor practice compliance costs.	Supply chain labor audits, compliance reports.	Modifier: Impacts operational reliability and reputational risk.	1. Include as part of 'Other Considerations' for supply chain-heavy industries (Moody's). 2. Reflect fair labor compliance in ESG overlays for manufacturing sectors (DBRS). 3. Adjust competitive positioning based on supply chain compliance (EthiFinance).
Consumers and End-users (S3)	Product safety compliance costs.	Customer complaints, product safety audit reports.	Driver: Affects revenue stability and market demand.	1. Reflect product safety risks in 'Operating Efficiency' for consumer industries (Fitch). 2. Include product recalls and safety metrics in ESG overlays (DBRS). 3. Apply qualitative modifiers for safety-sensitive industries like food and healthcare (Scope).
Affected Communities (S4)	Community engagement costs and social impact mitigation.	Community impact assessments.	Modifier: Affects reputational risk and operational reliability in sensitive areas.	1. Use community impact data as qualitative modifiers for industries operating in high-risk regions (Moody's). 2. Adjust credit profiles for high community impact sectors (S&P, HR). 3. Include community impact assessments in ESG overlays (DBRS).

Business Conduct (G1)	Regulatory compliance costs (e.g., anti-corruption measures, quality management systems). Public disclosure and reporting costs. Fines.	Disclosure of governance practices, ESG-related reporting metrics.	Modifier: Reflects governance quality and regulatory alignment.	1. Apply governance transparency as a qualitative modifier (S&P, Scope). 2. Use governance inefficiencies as part of 'Corporate Positioning' (HR). 3. Embed regulatory compliance within ESG overlays (DBRS).