

From Carbon Disclosure to Credit Judgement: How Rating Analysts Translate Scope 3 Emissions under Uncertainty

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Abstract

Scope 3 emissions place substantial corporate transition exposure outside the reporting entity and are commonly estimated from supplier, customer, product-use and expenditure data. Credit analysis may therefore distinguish environmentally significant information from evidence that is credible and financially material to repayment capacity. Archival research links carbon emissions, climate exposure and ESG variables to ratings and bond pricing, but does not reveal how analysts process uncertain value-chain information before a public rating outcome. This study examines how rating professionals assess Scope 3 materiality, manage incomplete disclosure and translate carbon-risk evidence into credit judgement. It uses an interpretivist qualitative design based on semi-structured interviews with current and former credit analysts, committee members, ESG and methodology specialists, treasury executives and a sustainable-finance adviser, supported by rating methodologies, issuer disclosures and climate-reporting standards. Abductive thematic analysis identifies a four-stage process. Analysts establish a financial transmission channel and rating horizon; assess disclosure credibility, prioritising transparency and consistency over apparent precision; bound incomplete evidence with sector, peer, capital-expenditure, product-market and management proxies; and subject the judgement to committee challenge. The resulting expression ranges from monitoring and rationale language to outlook or rating action. The study contributes a process explanation of climate-related credit judgement, reframes Scope 3 as an information-quality as well as a measurement problem, and shows how organisational routines discipline heuristic reasoning. The findings support category-level disclosure, explicit treatment of uncertainty and clearer communication of how climate evidence affects credit opinions.

Keywords: Scope 3 emissions; credit ratings; climate transition risk; bounded rationality

JEL classification: G24; G32; Q54; M14

1. Introduction

A credit rating is essentially a credit assessment which has been condensed into an opinion or viewpoint. This opinion is used for the pricing of debt in capital markets, for investment decisions, for purposes of regulation and for contracting purposes. The materiality, the sufficiency of information as well as the relevance of information used in the rating process are subject to the analysts and rating committees involved in the rating process. While the public letter grade is of concern, the rating process and the amount of information used in the rating process are also very important. When a rating agency releases information through a rating announcement, this information conveys new information to the capital markets. The views of a

rating agency can even affect an issuer's financing as well as the issuer's corporate policies (Hand et al., 1992; Kisgen, 2006; Frost, 2007).

For many climate-related risks and opportunities outside of an entity's value chain, the entity may not have direct control to mitigate or manage them. These risks and opportunities can affect entities throughout a value chain. In the Greenhouse Gas Protocol, the Greenhouse Gas Emissions from Scope 3 Activities are organised into 15 categories including: (1) Purchased goods and services; (2) Upstream transportation; (3) Use of sold products; (4) Waste not sent to landfills; (5) Downstream transportation; (6) End-use energy by sector; (7) Leased assets; (8) Franchises; (9) Outlook for Investments; (10) Other assets (e.g. intangible assets); (11) Decommissioning of assets; (12) Share-based payments; (13) Interest paid on customer debt; (14) Outstanding guarantees; and (15) Other (GHG Protocol, 2011, 2013). Information for these categories can be based on supplier data, an entity's expenditure, assumptions about how products are used, etc. and are reported within the boundaries of the entity using the information. As such, Scope 3 information can be 'soft' and expensive to verify (Liberti et al., 2019; Hettler et al., 2024; Vieira et al., 2024).

The disclosure environment is increasingly formalized. Under International Financial Reporting Standards (IFRS) issuers have to provide decision-useful information on climate change-related risks and opportunities (IFRS S2 Climate Change). The European Sustainability Reporting Standards recently introduced a so-called double-materiality architecture for climate-related disclosures. Importantly, proposed requirements for Scope 3 disclosures already have effects on companies' supply chain related operational choices (Carter et al. 2024). Yet, more disclosure does not automatically equal better and more meaningful information. The key challenges when working with disclosed information pertain to the boundaries of such information, the specific methods of estimation that are behind numbers, items that are not included in disclosure statements and the degree of value-chain transparency that companies actually reveal.

There is growing evidence that climate-related information affects the credit outcomes of corporations around the world. Studies have found that firms with higher levels of carbon emissions receive lower credit ratings (Safiullah et al., 2021), that climate-related regulatory risk affects bond ratings and spreads (Seltzer et al., 2022), and that firms from countries with higher levels of climate vulnerability have lower credit worthiness (Nguyen et al., 2025). Climate-related information as well as other ESG information have also been found to improve the statistical prediction of credit ratings (Michalski et al., 2024; Kilincarslan et al., 2025). While these studies are important in establishing that climate information is material to the credit outcomes of corporations, they do not provide any insight into how rating analysts incorporate such information into their ratings and related surveillance activities.

In terms of the formal rating methodologies, the so-called public rating frameworks of the rating agencies establish the scope of application for ESG information in credit rating assessments. Within this scope of application information is considered if it is material, relevant and verifiable within the rating time horizon and if it influences other rating drivers. ESG information is taken into consideration in rating assessments by rating agencies via sector-specific credit criteria in the case of S&P Global Ratings, via credit rating relevance scores in the case of Fitch, or as part of other rating input in the case of Moody's Investors Service. Hence these frameworks clearly distance the sustainability performance of a company from its

creditworthiness and – above and beyond that – leave substantial scope for rating analysts for the application of their professional judgement. This is particularly the case about the assessment of Scope 3 emissions information that is incomplete, long dated or already considered in the rating analyst's sector's assumptions.

This study attempts to address a gap in current research of climate-related factors in credit rating processes by outlining how rating analysts assess materiality and credibility of Scope 3 emissions information and how they handle lacking information in their rating judgements.

The study has three contributions. First, it outlines in detail the processes rating agencies go through to assess information on climate change-related issues, i.e. they first check for financial materiality, then assess the information's credibility, interpret available proxies, challenge the information within their committees and finally express their rating decision. Second, it transfers the concept of bounded rationality from individual decision-makers with too complex problems at hand to use simplifications to optimal solutions to the context of organizations that, too, work with simplified information. These methodologies that rating agencies apply to Scope 3 information are worked out in detail as an example. Third, the study reframes the information problem of Scope 3 emissions from a measurement quality problem to an information quality problem. The amounts of Scope 3 emissions may never be completely verified but the amount of uncertainty embedded in the numbers is transparent and the information of good sufficient quality to change the rating analyst's views of an issuer's debt repayment capacity. The issue is critical for rating agencies, for issuers of green bonds and for standard setters of ESG disclosure rules, all of whom are searching for ways to make information decisions useful rather than extensive.

2. Literature Review and Theoretical Framing

2.1 Credit ratings, climate risk and Scope 3 information

Credit ratings provided by issuers, such as corporations, reflect the rating institution's assessment of the entity's creditworthiness, which can be derived from a set of basic analytics such as the entity's profitability, leverage, liquidity, ability to generate cash flows, risk, and capital structure. In addition to such hard information, rating institutions also rely on soft information, which refers to information that is not easily quantifiable. However, even though a large body of work exists with respect to credit rating, the vast majority of the studies investigate several specific issues. These include, for instance, how capital and product markets react to changes in credit ratings (Fitch Ratings. 2019, 2023), what the incentives of rating agencies are, to what extent rating agencies are conservative and several other issues that rating thresholds have for firms. An exception, however, represents the question of how raters translate soft information into ratings.

Research on climate finance has shown that carbon and climate risks matter to investors and to creditors. Institutional investors indicate that they take climate change risks into account in their portfolio decisions. Already, the carbon exposure of companies is priced in equity and debt markets (Krueger et al., 2020; Bolton et al., 2021; Seltzer et al., 2022). The correlation between a company's carbon emissions and its credit rating is negative (Grunert et al., 2005; Safiullah et al., 2021). Climate-related vulnerability negatively affects credit ratings via default risk and cash-flow volatility (Nguyen et al., 2025). Using machine-learning rating models, Michalski et al. (2024) find that including ESG variables improves the quality of the ratings. Kilincarslan et al. (2025) finds a positive correlation between climate-related disclosure and credit quality.

However, all these studies identify only the input information disclosed by the companies and the output published by the rating agencies, without revealing the intermediate stages of the analysts' professional judgement.

Scope 3 information is a category of non-financial information which resides outside of an issuer's reporting boundary. Although an issuer reports on this information, it has influence but no control. Scope 3 information is typically reported using various methods within an industry and its relevance is higher in certain industries than others. Use-phase emissions would for example be more relevant for automotive and energy companies than for manufacturers. Scope 3 information is reported on an activity basis or on a supplier-specific basis. In some cases, Scope 3 information is disclosed on an industry average basis while in other cases Scope 3 information is reported based on an issuer's expenditures (Bag et al., 2025; Hettler et al., 2024; Vieira et al., 2024). All these characteristics make Scope 3 information a very suitable field of study for the role of soft information in the process of credit rating and finance in general.

As a starting point, information about a company's environmental and social performance is typically disclosed as part of the material information relevant to investors. However, rating agencies apply a much more restricted concept of materiality. In the rating analysis, only information that changes material credit driver(s) becomes relevant. In other words, a large part of environmental and social information becomes irrelevant for the rating. However, there are four separate questions that are often answered with the same data in practice: 1) How large are the environmental impacts of a company? 2) How reliable is the disclosure of such information? 3) How does the company cope with environmental challenges? 4) How financially material are the environmental effects of a company within a given rating time frame? Large environmental impacts do not necessarily translate into weak liquidity, and large environmental impacts do not necessarily imply a long transition period for a company. In fact, a relatively small environmental footprint can become a major issue for a company if the point in time when its environmental exposure becomes financially material is very close. The same applies to changes in environmental regulation, new environmental technologies that reduce the cost of environmental abatement, or even customers switching to greener suppliers (European Commission, 2023; Moody's Investors Service, 2021). In summary, the key question is how credit analysts make such distinctions based on incomplete, uncertain and company-specific information.

Table 1. Literature stream and research gaps.

Literature stream	Established evidence	Unresolved gap	Role in this study
Credit ratings and debt markets	Ratings convey information and affect financing choices (Hand et al., 1992; Kisgen, 2006).	Internal processing of specific non-financial information remains difficult to observe.	Treats Scope 3 as a judgement-process problem rather than only a market-outcome variable.
Climate risk and credit outcomes	Carbon emissions, regulatory risk and climate vulnerability are associated with ratings and spreads (Safiullah et al., 2021;	Archival designs observe inputs and outputs, not the professional reasoning between them.	Explains the mechanism connecting climate evidence to credit opinion.

	Seltzer et al., 2022; Nguyen et al., 2025).		
ESG and rating prediction	ESG and climate-disclosure variables improve rating prediction (Michalski and Low, 2024; Kilincarslan et al., 2025).	Predictive relevance does not establish direct methodological use.	Separates statistical association from analyst use and institutional materiality.
Scope 3 reporting and accounting	Scope 3 reporting is fragmented, boundary-sensitive and data intensive (Hettler and Graf-Vlachy, 2024; Vieira et al., 2024).	How credit analysts use imperfect category data remains under-examined.	Examines credibility assessment, proxy use and uncertainty management.

2.2 Bounded rationality, soft information and organisational processing

Bounded rationality is a key limitation to decision making by individuals as defined by Simon (1955, 1957). He explains that because of limited information, limited time and limited cognitive capacity to process information, the decision maker has to limit his or her search for alternative solutions, cannot verify all information supplied by others and therefore has to rely on incomplete information and in some cases on unverified supplier estimates. The information analysed has to be filtered through a framework of what is relevant and the various sources of uncertainty have to be assessed within a timeframe and a framework given by the environment in which the analyst works. All credit analysts use so called heuristics to assess and evaluate a company. By heuristics are meant a set of mental shortcuts or systematic rules that guide decision making. Most of the well-known heuristics in finance have been studied by behavioral scientists, such as the comparison of a company with its so-called peer group of companies, industry benchmarking, the capital expenditure as a percentage of sales of companies in the same industry, the track record of a company’s management, etc. Importantly, the value of such heuristics greatly depends on the environment in which they are applied and on the appropriate safeguards that are put in place to avoid the usual biases such as overconfidence, neglect of rare but extremely bad outcomes, so called path dependence etc. (Cao et al., 2024; Tversky et al., 1974; Mousavi et al., 2014).

From a financial information perspective, ratings analysts deal with ‘hard’ and ‘soft’ information. Hard information, according to Liberti (2019), refers to facts and numbers that can be quantified and thus easily standardized and separated from the context in which they were collected. Scope 3 information numbers, therefore, are ‘hard’ information for rating analysts. However, they also evaluate the information system behind the numbers and the boundaries of that system. In other words, the analysts assess how Scope 3 information was collected and whether all relevant information has been included in the numbers. The financial information numbers themselves are just a small part of the overall information that the analyst evaluates.

Organizational information-processing theory (OIP) views the organization as a system for information processing and decision making. The uncertainty of individual tasks within an organization influences information processing, the degree of required coordination and the organization’s ability to process the information required (S&P Global Ratings, 2021, 2024). In other words, the more uncertain individual tasks are, the greater the amount of information

processing required by the organization, the greater the required coordination and thus the greater the challenges the organization faces when processing information. It scans relevant information, assigns meaning to received information and acts upon it. Therefore, an organization's information processing system also refers to the methodology that rating agencies employ to process information. This methodology is developed by sector teams within rating agencies and consists of individual specialists who analyse companies within specific sectors. The information processed by these individuals is subsequently discussed in committees within rating agencies. The individual heuristics of analysts are thus explained and contrasted with the way other analysts treat identical entities. They are then tested against the rating agency's specific rating criteria.

All in all, a framework arises that sensitizes the scope that 3F financial information has for the credit analysis of corporations. The information on Scope 3 financial activities of corporations enters the credit analysis provided by rating agencies, provided that a financial channel of influence of said activities on the financials of the corporation under review can be identified. Then the influence of said financial activities on the financials of said corporation determines the weight given to the Scope 3 financial information when the credit worthiness of said corporation is assessed. Rating agencies can conduct credit analysis of corporations for their rated debt issues accurately if the rating analysts who work for these agencies can bound the information that is missing for a full analysis and if these agencies consider the disclosure credibility. The processing of Scope 3 financial information by rating agencies occurs as part of the regular credit analysis for corporations that are rated by said agencies within the sector teams that are responsible for said corporations (OWBCSD, 2004). Depending on the amount of information that is available for a given corporation, the Scope 3 financial information of said corporation may also be processed by analysts who specialize in 3F information and/or by committees of rating agencies (Securities and Exchange Commission, 2024a, 2024b). Two types of failure modes must be studied in detail in order to answer the research question above: On the one hand, information of Scope 3 financial activities of corporations can enter the credit analysis provided by rating agencies and receives too much weight, simply because this information is visible and easy to process, even if in reality said information is not very material for the financial performance of the corporation under review. On the other hand, the same Scope 3 information may not even enter the credit analysis for corporations, even if it is highly relevant, because the exposure to said information is not well measured yet, but the financial consequences of said exposure are already becoming clear. Empirical analysis of both types of failure modes is necessary therefore in order to gain not only insights on how information is used in the rating process of debt issues of corporations, but also to gain insights on how organizations that are prone to failures of the first type can be made to fail less often, and how organizations that are prone to failures of the second type can be made to fail less often.

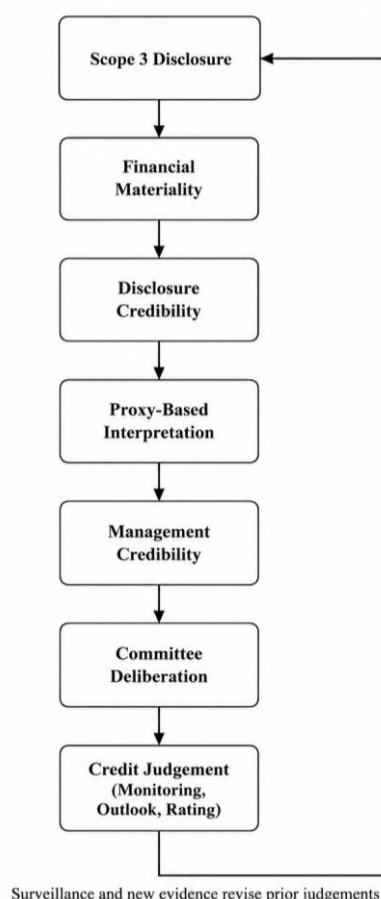


Figure 1. Sensitising framework for the translation of Scope 3 information into credit judgement.

3. Data and Method

3.1 Research design and empirical setting

The study uses an interpretivist qualitative design because the phenomenon of interest is an internal judgement process that is only partly observable in public data. The unit of analysis is the translation of Scope 3 information into corporate credit judgement, rather than an individual issuer or a single rating action. Field-based finance research is appropriate when archival records reveal decisions but not the reasoning through which practitioners construct them (Graham et al., 2001).

The empirical material combines semi-structured interviews with documentary evidence. Interview participants include current and former corporate credit analysts, rating committee members, ESG and methodology specialists, corporate treasury executives and a sustainable-finance adviser. This role diversity captures the process from inside rating analysis and from issuer-facing positions that observe information requests and challenge. The sample is purposively oriented towards carbon-intensive and transition-exposed settings, with energy, automotive and manufacturing represented explicitly in the interview material.

The final dataset comprised 45 interviews conducted between Oct 2025 and Jan 2026, with interviews lasting 30 minutes and covering Southeast Asia and Middle East. Participants were selected through purposive and snowball sampling. Selection criteria required direct professional involvement in credit-rating activities, ESG methodology development, rating-committee participation, treasury engagement with rating agencies, or sustainable-finance advisory work.

The sample was designed to capture multiple perspectives on how climate-related information is translated into credit judgement rather than to represent any single institution. Interviews continued until thematic saturation was achieved, defined as the point at which additional interviews generated limited new insight regarding materiality assessment, disclosure credibility, proxy use and committee deliberation. Table 2 presents the category of participants.

Table 2. Participants category

Participant Category	Number
Current corporate credit analysts	18
Former credit analysts	8
Current or former rating committee members	5
ESG / methodology specialists	6
Treasury executives	6
Sustainable finance advisers	2
Total	45

Participants were recruited through professional networks, industry referrals and snowball sampling. The study deliberately included both current and former rating professionals. Current practitioners provided insight into contemporary analytical routines, while former analysts and committee members were able to discuss decision processes more openly because they were no longer constrained by institutional communication restrictions. Inclusion of former practitioners therefore strengthened process understanding rather than compensating for limited access. To encourage candid discussion, all interviews were anonymised and no participant was asked to disclose confidential issuer information or non-public rating decisions. Table 3 summarizes the empirical sources and their analytical role. Participants represented experience across major international and regional credit-rating institutions as well as corporate issuers and advisory organisations. Agency identities are not disclosed due to confidentiality commitments.

Table 3. Empirical sources and analytical role.

Empirical source	Perspective captured	Analytical contribution
Current corporate rating professionals	Issuer analysis and sector coverage	Materiality tests, proxy use, surveillance and preparation for committee.
Former analysts and committee members	Reflective view of institutional thresholds	Committee challenge, disagreement, rating horizon and rating expression.
ESG and methodology specialists	Cross-sector and framework perspective	Disclosure credibility, assurance, consistency and methodological translation.
Corporate treasury executives	Issuer-facing experience	Information requests, transition planning and the credibility of capital allocation.
Sustainable-finance adviser	Reporting and engagement practice	Common disclosure weaknesses and the decision usefulness of category-level information.
Public documents	Formal institutional vocabulary	Triangulation using rating methodologies, GHG Protocol, IFRS S2, ESRS E1 and

Southeast Asia and the Middle East provide analytically useful settings because both regions contain carbon-intensive industries, expanding sustainable-finance markets and evolving climate-disclosure frameworks. The regions also encompass issuers facing substantial transition exposure through energy production, manufacturing, transportation and infrastructure sectors. While regulatory regimes differ from those in Europe and North America, participants largely described analytical processes derived from globally recognised rating methodologies and climate-reporting frameworks, including IFRS S2, the GHG Protocol and agency-specific credit criteria. The study therefore seeks analytical rather than statistical generalisation. The objective is to explain a decision-making process that may operate across multiple jurisdictions rather than to estimate region-specific effects.

3.2 Interviews and documentary triangulation

The interview guide covered five areas: the conditions under which Scope 3 becomes credit relevant; assessment of boundaries, methods, assurance and exclusions; treatment of incomplete or inconsistent data; the use of sector, peer, strategic and management proxies; and translation into committee discussion, rationale language, outlooks or rating actions. Questions were open enough to elicit disagreement and sector variation. Follow-up prompts asked participants to explain what would increase or reduce confidence and what would prevent a climate issue from affecting the rating.

Documents included public ESG and climate methodologies from Moody's, S&P Global Ratings and Fitch; the GHG Protocol Scope 3 Standard and calculation guidance; IFRS S2; ESRS E1; and selected issuer disclosures. These materials were not treated as evidence of confidential deliberations. They served three narrower purposes: establishing the formal vocabulary of credit materiality, comparing public methodology with practitioner accounts and checking whether participants' descriptions were consistent with disclosed institutional frameworks. Documentary evidence was coded separately from interview evidence so that public statements about policy were not presented as proof of internal practice. Convergence strengthened interpretation; divergence was retained as a finding about the distance between formal methodology and working judgement.

3.3 Analysis and trustworthiness

The study uses abductive thematic analysis. First-cycle coding remained close to participant language, including "repayment capacity," "timing is critical," "transparency around uncertainty," "actions, not presentations," and "outlooks reflect emerging risks." Process codes captured what analysts did with information: linking, screening, comparing, bounding, challenging and translating. Second-cycle coding grouped these observations into four aggregate dimensions: establishing credit-channel materiality, evaluating disclosure credibility, bounding uncertainty through proxies and institutionalising judgement through committee review. The data structure follows the transparency logic of Gioia et al. (2013) while allowing iteration between empirical material and the theoretical lenses of bounded rationality and organisational information processing. Thematic analysis procedures were informed by Braun and Clarke (2006).

Negative cases were retained rather than resolved away. Participants disagreed over the weight of third-party assurance, whether weak disclosure signals poor governance or limited

reporting capability, and how far a rating horizon should accommodate long-term transition risk. These tensions refine the model by identifying conditions under which the same evidence receives different weight. Coding therefore distinguished consensus claims from contingent claims. A theme was treated as central when it recurred across role groups, while sector- or role-specific differences were reported as boundary conditions rather than averaged into artificial agreement. Consistent with qualitative research guidance, saturation was assessed through continuous monitoring of code emergence. Interviews conducted during the final phase largely reinforced existing categories and relationships rather than generating substantively new themes, suggesting adequate saturation had been reached.

Trustworthiness was supported through role and sector triangulation, comparison with public documents, an audit trail of coding decisions, and separation of process claims from causal claims about rating changes (Lincoln and Guba, 1985). Quotes were selected only from the interview material supplied for the study and are attributed by professional role. Table 4 presents the coding architecture.

Table 4. Data structure and coding architecture.

Illustrative first-order evidence	Second-order theme	Aggregate dimension
"Repayment capacity"; "what changes in the financial profile?"	Financial transmission	Credit-channel materiality
"Timing is critical"; issue outside the rating horizon	Materiality versus immediacy	Credit-channel materiality
Use-phase versus purchased-goods categories	Sector-specific category relevance	Credit-channel materiality
Boundaries, assumptions and year-to-year consistency	Method transparency	Disclosure credibility
Targets compared with investment plans	Internal coherence	Disclosure credibility
Assurance helps but may create false certainty	Contested credibility cues	Disclosure credibility
Peers, sector averages, product mix and regulation	Exposure bounding	Proxy-based interpretation
"Actions, not presentations"	Management credibility as soft information	Proxy-based interpretation
Financial impact, peer treatment, timing and confidence	Structured challenge	Committee translation
Monitoring, rationale, outlook and rating action	Graduated rating expression	Committee translation

Note: The table is a Gioia-inspired display of the abductive analysis rather than a claim of purely inductive theory generation.

4. Findings

The analysis identifies a staged but iterative process. Scope 3 information first faces a materiality test based on financial transmission and timing. Analysts then assess whether the disclosure is credible enough to use. Missing information is bounded through multiple proxies, including management behaviour. Committee deliberation tests the resulting judgement against

methodology, peer consistency and evidential confidence. The output is not necessarily a rating change; it may be surveillance, rationale language or an outlook signal.

4.1 Financial materiality is established through transmission channels and timing

Participants consistently rejected emissions magnitude as a sufficient credit signal. The starting question was whether the exposure could plausibly change the issuer's capacity to service debt. A senior corporate analyst stated:

"Scope 3 becomes relevant when it affects future earnings, operating costs, or access to financing. We are primarily concerned with repayment capacity."

This logic directs attention to revenue resilience, cost inflation, capital expenditure, product substitution, refinancing and strategic flexibility. A rating committee member described the test more bluntly: "What changes in the issuer's financial profile because of this information?" A treasury executive reached the same conclusion from the issuer side, observing that rating agencies appeared less interested in absolute emissions than many investors expected because they focused on financial consequences.

The financial link was necessary but not always immediate. An ESG specialist cautioned that "a sustainability issue may eventually become a credit issue, particularly when regulation is changing rapidly," while a former analyst noted that many firms have large Scope 3 emissions but limited immediate credit implications because "timing is critical." The distinction is not between important and unimportant climate risks. It is between risks that can be connected to financial outcomes within the rating horizon and risks that remain strategically relevant but too remote or uncertain for current rating weight. Participants described the horizon as a practical filter rather than a fixed calendar rule. Asset life, refinancing needs, policy visibility and the speed of product substitution could pull a long-term issue into a nearer-term credit assessment.

Sector context determines the transmission channel. An automotive analyst identified use-phase emissions as important because future vehicle demand can change, whereas a manufacturing analyst emphasised purchased goods and supplier emissions because they affect production costs. An ESG analyst summarised the pattern: "It depends entirely on sector context. There is no universal answer." Category selection is therefore an analytical decision about business-model exposure, not a mechanical ranking of the largest reported categories.

Large emissions were not ignored when they fell below the action threshold. Participants distinguished attention from rating effect. One analyst explained that high emissions "may not affect the rating," while another said they could trigger ongoing surveillance. Risks may also be partly captured in sector assumptions before issuer-specific Scope 3 evidence is considered. This produces a materiality-immediacy tension: analysts monitor exposures that could become material but avoid double counting or acting before a sufficiently specific financial pathway emerges.

4.2 Disclosure credibility depends more on transparency than apparent precision

Once a plausible credit channel was identified, analysts assessed whether the disclosure could support judgement. Participants focused on boundaries, assumptions, category coverage, consistency over time and alignment with strategy. An ESG methodology specialist highlighted "clear explanations of boundaries and assumptions," while a credit analyst prioritised "consistency from year to year." These features allow analysts to distinguish operational change from changes in methodology or reporting perimeter.

Internal coherence mattered as much as formal reporting quality. A former analyst looked for "agreement between disclosed targets and investment plans." Ambitious targets carried limited weight when capital allocation, technology choices and asset strategy pointed elsewhere. Conversely, explicit explanations of uncertainty could increase usefulness even when the underlying estimate remained imprecise. A treasury manager described the desired feature as "transparency around uncertainty," and a methodology specialist expected explanations whenever categories were excluded.

Participants therefore preferred understandable uncertainty to unsupported precision. Aggregate totals were criticised when they concealed category drivers. A sustainable-finance consultant explained that many companies report a total without identifying which categories create most of the exposure; the problem is that "a large total figure alone doesn't explain future business implications." Category-level disclosure enables analysts to locate the risk in products, suppliers, customers or financing activities and connect it to an appropriate credit channel.

Third-party assurance was useful but contested. Some participants said that it improved confidence, while others described it as helpful but not decisive. One former analyst warned that "sometimes assurance creates a false sense of certainty." The common position was that assurance does not remove the need to understand methods and assumptions. It is a credibility cue, not a substitute for analysis.

Poor disclosure also had ambiguous meaning. Persistent weakness relative to peers could become concerning and, in some cases, signal weak governance or risk systems. Yet another participant cautioned that it may be "simply a reporting-capability issue rather than a risk issue." Analysts therefore treated disclosure quality first as a confidence adjustment. It became a credit concern only when repeated opacity, weak controls or inconsistent explanations supported a broader inference about management and preparedness. This distinction prevented a mechanical penalty for firms operating with immature supplier data while still allowing persistent non-disclosure to become informative when peers faced similar constraints but reported more transparently.

4.3 Incomplete evidence is bounded through multiple proxies and management behaviour

Incomplete data is the norm rather than the exception. Incomplete data is very common. We rarely have perfect information. So, in many cases we have to make some judgements. Incomplete data is never a problem in and. It is how you treat it. In many cases we rely on enough evidence to take a view on the likely direction and magnitude of any exposure.

A number of participants commented on the different types of proxies that are used, including: (i) peer group benchmarks; (ii) industry averages; (iii) a company's product or service mix; (iv) customer demand; (v) a company's exposure to different levels of regulation; (vi) the level of capital expenditure required to implement transition; and (vii) historical behavior of a company's management. A current corporate analyst stated that he uses several different indicators to try and estimate potential exposure to risk of credit downgrading to assess whether he thinks credit risk has been underestimated by others. He stated that he uses several different indicators including sector averages and other indicators to assess potential exposure in many cases rather than replacing Scope 3 data with a single number.

None of the proxy indicators are particularly favored by analysts, though they would consider the capital expenditures required for transition as particularly relevant. The exposure of a company's business model is also important as well as the impact that a company's customers

have on the emissions of the company in consumer-facing industries. A Committee member noted that in using a variety of proxy indicators, “analysts use multiple proxies, not one. They give a range of answers.” Thus, a variety of indicators provide the analyst with a range of possible answers which can then be used to attempt to come to a best estimate of a company’s transition-related exposures.

In addition to the indicators mentioned above, other data or even proxies can form part of the proxy set. However, these also need to be viewed with a degree of skepticism, as was mentioned before. A former credit rating analyst commented that “Credibility is about actions not words”. Therefore, as a rating analyst you need to see whether the management’s words are translating into actions, specifically in relation to their climate change implementation. This would involve reviewing whether the management are reporting consistently and meeting their targets, as well as having an open dialogue regarding the issues that they are facing with implementation. Conversely indicators that signal weak climate change management would include frequent changes in methodology; missing targets; unseen gaps in data; and lastly a large disconnect between the climate change commitments that a company is making and where the company is actually directing its capital expenditure.

The assessment of management quality of a company constitutes an important factor that can increase the confidence that is put into the information that was not available for various reasons. However, sufficient quality support is needed to increase confidence, and it is not sufficient on its own to increase confidence and convert the weak data into a strong rating decision. The trust in the management quality of a company thus is different from the verification of information that was not available. The verification of the management quality of a company is soft information that is used to interpret the information that a company publishes.

The combination of indicators creates a bounded problem for rating analysts. Even when there are uncertainties in measuring emissions by a company, and there are gaps in Scope 3 data for a company, the information already collected can point in a single general direction for assessing credit risk. The information that is missing can become very material in assessing a company’s relative risk if the information that is available paints a solid picture of substantial exposure to financial risks and costs of transition to a low carbon economy. The analyst uses the available information and information that is missing to compare companies in the peer group. The analyst also develops a stopping rule to identify when additional information collection will not change the credit-based conclusion either way. Such a use of available information is very different from when all available information is used to try to estimate the total Scope 1 and 2 plus Scope 3 emissions of a company, with the aim of trying to resolve all uncertainties in the available data.

4.4 Committee deliberation institutionalises judgement and determines rating expression

Individual analysis does not automatically become an institutional rating view. Participants described committee deliberation as the point at which Scope 3 evidence is translated into the language and thresholds of the rating methodology. A current analyst said that climate issues are “usually raised within broader business-risk discussions.” A committee member added that analysts must demonstrate “a credible financial transmission pathway,” and a former chair said the issue must be framed in rating-methodology language.

Committee challenge concentrated on five questions: What is the financial impact? Is the exposure already reflected in sector assumptions? What is the timeline? How reliable is the

data? How are peers being treated? These questions test relevance, double counting, horizon, confidence and consistency. ESG specialists supplied context, but participants said they did not independently drive the decision. The rating conclusion remained anchored in the broader credit profile.

Several barriers could prevent action: insufficient evidence, uncertain timing, weak linkage to financial performance, offsetting financial strength and exposure outside the rating horizon. These barriers explain why Scope 3 may appear in internal surveillance or public rationale without changing the rating. The absence of action is not evidence that the issue was ignored. It indicates that the issue did not cross both the materiality and confidence thresholds required for a stronger rating expression.

Outlooks provided an intermediate response. One analyst said, "Outlooks reflect emerging risks," whereas another noted that "ratings require stronger evidence." A committee member described outlook use when a risk was becoming more visible but had not yet affected financial metrics. An outlook can therefore communicate directional concern without asserting that the current rating level is already inconsistent with expected creditworthiness. Public rationale language serves a related but weaker function: it records the issue and its transmission channel, while signaling that evidence or timing remains insufficient for a formal change in rating direction.

Disagreement was common because climate evidence combines uncertain measurement with uncertain timing. Participants reported differences between members who prioritised near-term metrics and those who emphasised strategic exposure. The disagreement was not regarded as a failure. One committee member argued that it was "often healthy because it improves the quality of the final decision." Committee review turns individual heuristics into a contestable organisational judgement by requiring explicit assumptions, comparable peer treatment and a defensible link to methodology.

Figure 2 integrates the four dimensions. The process is staged but recursive. New regulations can change the materiality assessment; improved disclosure can increase confidence; committee challenge can send the analysis back for additional evidence. The possible outputs form a gradient from monitoring to outlook language and rating action rather than a binary affected-unaffected result.

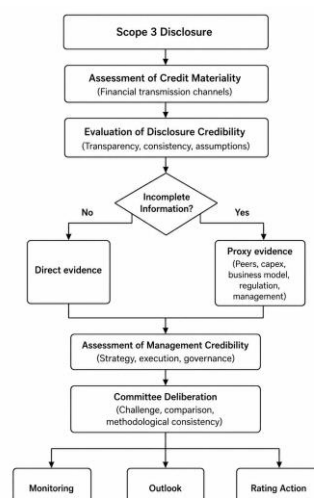


Figure 2. Emergent process model of Scope 3 credit judgement.

Participants described the process as iterative rather than strictly linear. New regulatory developments, revised disclosures or committee challenges frequently triggered re-evaluation of earlier assessments. Committee deliberation sometimes identified evidential weaknesses that required further analysis before a judgement could be finalised. The model should therefore be interpreted as a dominant sequence of analytical activities rather than a rigid workflow. Feedback loops are integral to the process because materiality, credibility and confidence are continuously reassessed as new information becomes available.

Table 5. Cross-theme findings and rating expressions.

Process dimension	Central finding	Key tension or negative case	Likely expression
Credit-channel materiality	Emissions matter when linked to repayment capacity through a plausible sector-specific channel.	Strategic importance may exceed immediacy; sector risk may already capture part of the exposure.	Monitoring, business-risk discussion or rationale.
Disclosure credibility	Transparent boundaries and stable methods matter more than unsupported precision.	Assurance is useful but not decisive; poor disclosure may reflect governance weakness or limited capability.	Confidence adjustment, issuer engagement or caveated rationale.
Proxy-based interpretation	Multiple proxies bound exposure without recreating a full emissions inventory.	Proxies simplify reality; missing data are not automatically negative.	Scenario discussion, surveillance or outlook sensitivity.
Committee translation	Methodology, peer treatment, timing and confidence convert analyst judgement into an institutional view.	Near-term metrics can conflict with long-term transition risk.	No action, rationale language, outlook or rating action.

Note: Table 5 is an author-developed synthesis derived from the abductive thematic analysis described in Section 3.3. The process dimensions emerged from coding procedures informed by Braun and Clarke (2006) and the Gioia-inspired data structure presented in Table 4, while interpretation was sensitised by bounded rationality (Simon, 1955, 1957), hard-soft information theory (Liberti and Petersen, 2019), and organisational information-processing theory (Galbraith, 1974; Daft and Weick, 1984).

5. Discussion and Implications

5.1 Explaining the process between climate disclosure and credit outcomes

Existing climate-finance studies show that carbon emissions, regulatory exposure and climate vulnerability are associated with ratings, spreads and default risk (Safiullah et al., 2021; Seltzer et al., 2022; Nguyen et al., 2025). Predictive studies also show that ESG and climate-disclosure variables contain information relevant to rating classification (Michalski et al., 2024; Kilincarslan et al., 2025). The process model explains why these associations are neither mechanical nor uniform. A disclosed Scope 3 value acquires credit meaning only after analysts

connect it to a financial pathway, assess the credibility of the disclosure, use other evidence to bound uncertainty and obtain institutional support through committee review. The distinction between outlook action and rating action emerged primarily from differences in evidential confidence and timing. Outlooks were typically used when a credible financial transmission pathway had been identified but uncertainty remained regarding magnitude or timing. Rating actions occurred only when participants believed that financial consequences were sufficiently likely and sufficiently material to alter the issuer's expected credit profile.

This account separates statistical relevance from methodological use. A variable can predict ratings because it correlates with sector, business quality, regulation or management capability without entering a committee as a direct input. Conversely, an exposure that is difficult to measure can still influence a credit view if several proxies converge on a near-term financial effect. The model also clarifies why improved disclosure may affect analytical confidence before it affects the rating itself. Better data can narrow the range of plausible outcomes, sharpen surveillance and change the wording of sensitivities without moving the central estimate of creditworthiness. The model therefore complements archival evidence by identifying the organisational mechanism through which climate information becomes actionable.

5.2 Theoretical contributions

The first contribution is a process theory of how climate information affects credit rating judgements. Previous work identified various environmental variables and their effects on credit markets or rating outputs. However, the study of intervening variables or so-called “gates” (monitoring, rationale, outlook and rating action) by which environmental variables are translated into rating expressions has been seriously lacking. Developing a process model that shows how given emissions profiles are translated into differing credit treatment by different rating agencies, and how an unchanged rating can receive a great deal of analysis attention.

The second contribution therefore relates to the concept of bounded rationality of decision making in fields. I extend bounded rationality from individual analysts to the organization that enables rating agencies to deliver thousands of opinions on time. All heuristics applied by analysts within rating agencies are turned into ‘sufficing’ yet fully defensible judgements via the process of ‘triangulation’ (or combining of different information sources, ‘peer comparison’ and ‘committee challenge’. Sufficing judgement is thus turned into accountable judgement via the routines of organizations which in turn expose the underlying assumptions and require methodological consistency. This study thus furthermore provides new insights into the process of committee deliberation and how this body of individuals governs the level of uncertainty that is carried into an opinion issued by rating agencies.

Third, this study shifts the focus of Scope 3 from a measurement problem to an information quality problem that affects how the information is used by the credit analyst. The quality of Scope 3 information that is disclosed by a firm is soft for rating agencies because it is quantified and therefore verifiable, but at the same time the information is embedded in soft information about the firm. This study therefore establishes that while better measurement of a firm’s Scope 3 emissions is valuable for credit analysts, they do not need a complete and perfect verified Scope 3 inventory to form a view of the firm. Instead, what is relevant to them is information about the boundaries of the disclosure, the methods used to estimate the emissions, information about the categories of emissions that are most decision-relevant, and some sense of the uncertainty surrounding the numbers that have been disclosed. This study therefore contributes

to the hard-soft information literature (Liberti et al., 2019) by establishing that even numerical disclosures can be soft, and that soft information, including information about a firm's management behavior, can be either valuable or useless depending on the context in which it is disclosed. This study also contributes to the organizational information-processing literature (Daft et al., 1984) by establishing that rating agencies do not merely receive information about a firm's climate risk from a firm and then incorporate that information into a credit opinion. Rather, the information that is received by the rating agency is equivocal and the rating agency must then interpret, compare, and translate the information into a credit opinion. In this sense, this study establishes the conditions under which the judgement exercised by credit analysts is constrained enough to be auditable and comparable, even when the data upon which the judgement is based is poor.

5.3 Practical implications

The findings of this study can also be used by rating agencies in rating company's climate performance. When making a rating public rating agencies should clearly distinguish between four different aspects of a company's climate performance. The four different aspects that should be distinguished are: 1) the magnitude of the company's emissions; 2) the quality of the information disclosed by a company on its climate exposures; 3) the company's transition preparedness; and 4) the financial materiality of climate-related risks to a company. Furthermore, rating agencies should clearly state in their public rationales whether they consider climate information when monitoring a company, when setting an outlook on a company, or when determining a company's rating. In their public rationales they do not have to disclose the confidential deliberations of their committees.

Information disclosed by a company is of no use to rating agencies if it is not organised in a manner that allows the analysts to understand its significance. The company's information disclosure therefore has to be organised in such a way that it is clear which information is within which categories, that the same method of measurement is used for all relevant information, that the scope of the information is transparent (i.e. that the boundaries of the information are clear and that the reasons for any exclusions from the scope are also clear), and that there is clear evidence of the link between a company's transition targets and its capital allocation. A sustainability narrative of the highest quality that does not reflect a company's investment decisions will not generate any credit worthiness.

This study offers important implications for regulatory bodies, and rating agencies such as S&P Global, Moody's, Fitch and DBRS. While Scope 3 information should be disclosed in the most transparent and reliable way, standardization of such disclosure is important to create comparability among companies. However, such comparability should not be achieved at the cost of interpretability. Credit intermediaries require a significant amount of information on a corporation's Scope 3 emissions, including information on the data-lineage as well as an explanation of the boundaries of the reported categories. Within each category, the amount of information disclosed is also important. Furthermore, the amount of uncertainty associated with the reported Scope 3 information needs to be indicated to users of such information to help them assess both the quality of the disclosure and the ability of the reported information to transmit relevant financial information.

5.4 Boundary conditions and research agenda

This research study develops a process theory of the process of how rating agencies evaluate Scope 3 information when assigning a credit rating to a corporate issuer. In contrast, rating agencies that assign bank ratings to retail customers, or sovereign ratings, or credit ratings to structured finance products such as mortgage-backed securities and covered bonds, all follow very different goals and use very different information. Hence an interview study of the processes that rating agencies employ is not the same as estimating the average causal effect of the amount of information disclosure about an issuer's Scope 3 information that a rating agency requires before it forms a view about the rating for that issuer. The issuers that are selected for the study, i.e. the issuers that are willing to be interviewed about their climate risk analysis are very likely to differ from all other issuers in ways that are material to the questions posed in the study. There are many more specific issues that are related to the process model presented here. One possible way to test the implications of this process model is to analyse in more detail the disclosure of information by issuers on a category-by-category basis and how rating agencies use a stable method to assess the climate related risks of an issuer.

Another possible test of the process model is an experiment, in which rating agencies are asked to what extent they rely on different types of information with respect to the climate-related risks of an issuer. Such an experiment could for instance test the weight that is given to Scope 3 information, the weight that is given to such information when the scope of the disclosure is not entirely clear, the weight that is given to information about an issuer's transition risks, the weight that is given to information about an issuer's risks that are affected by climate change, the weight that is given to information about an issuer's climate change related opportunities, the rating horizon that is used to assess the risks and opportunities of an issuer with respect to climate change, the degree to which external parties are taken into account when assessing an issuer's climate change related risks. Finally, it would be very interesting to test the extent to which similar heuristics are used by banks, by asset managers, and by rating agencies. In other words, it would be interesting to test the extent to which these organizations' ways of dealing with climate change are similarly disciplined.

6. Conclusion

This study explains how rating professionals translate uncertain Scope 3 emissions information into corporate credit judgement. The answer is not a direct mapping from carbon quantity to rating outcome. Analysts begin with a financial-materiality test: the exposure must have a plausible pathway to revenue, costs, investment, financing or strategic flexibility within the rating horizon. They then assess whether the disclosure is credible enough to use. Transparent boundaries, stable methods and category-level explanation matter more than apparent numerical precision. Where information remains incomplete, analysts combine sector, peer, product-market, regulatory, capital-expenditure and management evidence to bound the range of plausible credit effects. Committee deliberation then tests the judgement against methodology, peer consistency and confidence thresholds.

The resulting rating expression is graduated. Scope 3 information can remain a monitoring item, enter rationale or outlook language, or contribute to rating action. This explains why environmental significance and credit materiality can diverge without implying that analysts ignore climate risk. It also explains why improved disclosure may change confidence before it changes the rating.

The central contribution is to show that Scope 3 becomes financially meaningful through organisational judgement rather than disclosure alone. Bounded rationality is managed through structured heuristics, while committee routines convert those heuristics into contestable institutional conclusions. For practice, the implication is direct: issuers should disclose the categories, assumptions and investment consequences that make transition exposure analysable; rating agencies should communicate how uncertainty affects rating expression; and standard setters should design disclosure that supports interpretation as well as measurement.

Declarations

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Ethics approval. The study was conducted in accordance with applicable institutional ethical requirements for research involving human participants.

Data availability. Interview transcripts are not publicly available because disclosure could compromise participant confidentiality. Anonymised supporting material may be made available subject to ethics approval and the consent terms agreed with participants.

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