

**When does “green” stop being marketing and start being
decision-useful information?
Evidence from Europe’s regulatory rule**

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**Evidence from Europe’s regulatory rule stack and bank-issued
sustainable debt markets.**

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Introduction

This study explores the development of sustainable finance in Europe, from an early period when it was based on voluntary principles and reputation-building towards a new phase characterized by increased regulation, supervision, and data standardization.

The primary issue is no longer whether capital markets support assets with an ecological orientation, but whether claims made regarding sustainability can be subject to cross-examination in the areas of law, prudent regulation, and market infrastructure.

Against this background, this research addresses a specific, but significant question: At what point does "green" cease to be a marketing term and become useful information for decision-making?

This dissertation suggests that the difference lies not in the ambition of the claim or the issuer's moral intentions, but in the extent to which the evidence supporting the claim is institutionally coherent.

In European sustainable debt markets issued by banks, sustainability labels are increasingly embedded in a complex "rule stack", consisting of the EU Taxonomy (EU-T), the EU Green Bond Standard (EU-GBS), the Sustainability Disclosure Regulation (SDR) and Corporate Sustainability Reporting Directive (CSRD)/Environmental Social Governance Report (ESG-RS), and Environmental, Social and Governance (ESG)-related Pillar 3 reporting under prudential regulation. Each layer performs a different function, but collectively they provide a framework for verifying each other's claims, which convert environmental claims into standardized pieces of structured information that affect funding costs, access to funding, and perceptions of risk.

The dissertation employs three analytical approaches. Firstly, it investigates the dynamics of individual issues, specifically, the structure of the order book, the behaviour of spreads, and the conditional nature of the greenium. Secondly, it examines the level of institutional coherence in the sustainable financing strategies of major European banks relative to their prudential and taxonomy reporting. Finally, it identifies the mechanisms through which shocks to credibility affect funding curves, regulatory exposures, and the defensibility of investor mandates.

The core contribution of this dissertation is to transform the understanding of greenwashing from a reputational anomaly to a structural contradiction detectable within a multi-layered regulatory regime. "Green" is decision-useful only to the extent that it is replicable, verifiable, compatible with multiple disclosure regimes, and consistent with reality as reflected in the issuer's financial statements. In a regulatory environment, credibility is not declared; it is constructed.

Chapter 1

The credibility problem

Sustainable debt has moved from a side tool to a part of capital markets. The labelled instruments have grown; the labelled instruments have not solved the uncertainty that still hurts confidence. The mismatch, between the sustainability claims and the keeps confidence low. As the issuance volumes grow and the regulatory expectations tighten the line between the marketing narratives, and the decision-useful evidence becomes important for the economy and for the institutions. The distinction matters for the economy and, for the institutions. The core idea is that credibility does not come from any policy any disclosure rule or any voluntary guideline. Credibility depends on the evidence that can move across co linked layers: instrument integrity at issuance portfolio discipline at asset management and prudential verification, at the balance sheet level. Europe is now the place, for the evidence chain. The EU Green Bond Standard (EuGBS) the ICMA reporting canon, the ESMA fund-naming regime and the EBA/BCBS Pillar 3 ESG templates all link together in one system that is becoming more enforceable. The link of the EU Green Bond Standard (EuGBS) the ICMA reporting canon, the ESMA fund-naming regime and the EBA/BCBS Pillar 3 ESG templates makes the system clearer and more enforceable. The aim, in this chapter is to open the box of debt to show how the information is produced how the information is filtered and how the information is validated along the chain. The first building block is the theory of information asymmetry, it explains that the labelled instruments reduce uncertainty when the underlying data as taxonomy alignment eligibility criteria KPI methodologies, lookback periods and impact metrics, are judged independently and reproduced. In my view the literature, on signalling shows that the markets reward the issuers who incur verification costs and who design frameworks that can stand the supervisory and investor scrutiny. The sustainable debt then works not as a branding exercise but as a mechanism that the issuers use to reveal high-quality information, about transition progress, environmental performance and capital-allocation choices. The growth of the market shows that the narrative-based signals are insufficient, demonstrating that greenwashing typologies have become more complex. Greenwashing now include requirements and loose rules, about how money is used, claims that say the impact is bigger than it is, ways of measuring performance and a rise in "bonds that do not match the real balance sheet. Lastly, these typologies show that we need checks that keep the chain of sustainability disclosures in line. This chapter shows the rule stack, as Europe's answer to the challenge. The rule stack is meant to guide institutions. At the instrument level the EuGBS adds a label that is based on the EU Taxonomy; the EuGBS label needs documentation before it is issued allocation reports after

it is issued and review by registries. At the time the ICMA moves from being a voluntary principles setter to a quasi-reporting system. The ICMA uses sector guidance, common impact reporting templates and clear expectations, for project disclosures. At the portfolio level the ESMA fund-naming guidelines force asset managers to prove ESG fund names with shares of assets. The ESMA fund-naming guidelines raise the proof bar, for adding labelled bonds. At the level Pillar 3 disclosures turn claims, in labelled instruments into data. Pillar 3 disclosures do this through the Green Asset Ratio (GAR) the Banking Book Taxonomy Alignment Ratio (BTAR) and climate risk templates. These layers together build a system that's not just descriptive but works together. If the information is inconsistent, incomplete or cannot be verified at any point, in the chain the investors, the supervisors or both can detect the information. Placing the thesis, in this structure matters. I think the thesis guides the method and the data expectations for the chapters. The central research question: when does "green" stop being marketing and start being information that helps decisions? asks that. I examine the research question, through this layer view. I think the hypothesis is that issuers who align the instrument level documentation, with the portfolio level requirements and the prudential disclosures achieve market outcomes. Better market outcomes mean order books and tighter pricing spreads. Issuers whose frameworks have assurance, inconsistent KPI methods or limited taxonomy alignment face higher credibility risks. May be excluded by investors. The chapter points out the gaps that remain even though the rule stack has moved forward. The gaps are, about how deep the checkers where the data comes from who gets credit for the project and how easy it is for computers to read the reports. The gaps are not ideas. The gaps are problems that add work for investors and shape market results. The gaps also set up the data and governance analysis that follows in the rest of the thesis. The rule stack changes sustainability claims into evidence that can be compared and used by supervisors. The rule stack does the work. The chapter gives the idea for the thesis. The next chapter looks at how the principles work in life through rules, standards and reporting frameworks. The core study checks if credibility gives benefits in issuing and, in the market. The final chapter looks at how governance structures, assurance choices, enforcement, by supervisors and digital audit can fix the remaining gaps. The logic of the work therefore proceeds from theory to practice, from narrative to evidence, and from market claims to balance-sheet verification: a progression that mirrors the very evidentiary chain upon which the future of sustainable finance is being built.

1.1 Why can't sustainability claims rely on trust?

Sustainable finance changed from a niche experimentation model to the basis of the European Capital Markets (European Commission, 2021)¹, even if confidence still has deep roots on whether claims in relation to sustainability have the possibility to be verified beyond marketing segment. The proposition that advances this thesis is simple and clear: highlight and trust scales mostly when evidence travel across three layers: portfolio discipline, instrument integrity, and proofs from the balance-sheet. In relation to the European setting, this proposal is testable thanks to the market and regulatory backbone that has crystallised into interlocking “rule stack” (OECD, 2022)².

From an instrument perspective, the EU Green Bond Standard (EuGBS) and the International Capital Market Association’s reporting canon clearly states the evidence expectations and design logic for labelled debt. European Securities and Markets Authority (ESMA), at the portfolio level, they constraints use of ESG-related terms in fund names, strengthening the linkage between promises to end-investors and asset selection. Whilst European Banking Authority’s Pillar 3 disclosures (based on the GAR, the climate-risk tables and the Banking-book Taxonomy Alignment Ratio (BTAR)) from a prudential point of view, translate and transcript the overcited promises into numbers that can be comparable and supervisory-graded (Technical Expert Group on Sustainable Finance , 2019)³.

The following empirical studies will test if issuers that align their data and documentation together with this stack will obtain better measurably market outcomes, together with remaining frictions as assurance depth or data lineage can now be referred as the binding constraints to credibility at scale.

1.2 Building a system that makes claims verifiable

The consolidation that rotates around Europe’s sustainable debt backbone is made up of a three-part rule stack that is strictly linked with what issuers promise, how portfolios are marketed to end-investors and what instruments really finance. At its basis, the Eu Green Bonds offers a legally and voluntary grounded label that find its connection with the EU taxonomy, prescribing post-issuance allocation reports and pre-issuance factsheet (Technical Expert Group on Sustainable Finance , 2019)⁴. Requiring external involvement and review by approved reviewers. The aim of EuGBS is not limited to micromanage frameworks effectively but to standardise the core principles of credibility (governance over evaluation and selection, proceeds management, eligibility logic and content and

¹ European Commission, Strategy for Financing the Transition to a Sustainable Economy (COM/2021/390 final), Brussels: European Commission, 2021, pp. 2–3

² OECD, ESG Ratings and the “Trust Gap”, Paris: OECD Publishing, 2022, pp. 5–6.

³ Technical Expert Group on Sustainable Finance, Report on the EU Green Bond Standard, Brussels: European Commission, 2019, pp. 12–17

⁴ Technical Expert Group on Sustainable Finance, Report on the EU Green Bond Standard, Brussels: European Commission, 2019, pp. 12–17

cadence of reporting), to allow verification to be comparable across issuers over time. Parallely, International Capital Markets Association (ICMA) changed and evolved its Green Bond principles and handbooks from a high-level guidance into edge-case interpretation, data structure and applied canon for impact reporting (International Capital market Association, 2022)⁵. To consolidate sector annexes and recommend baselines and metrics the Harmonised Framework for Impact Reporting comes into play, while the “green enabling projects” guidance Enlight when value-chain components such as specialised equipment’s or grid enforcements may legitimately count as enablers without outcomes overstated. From the demand perspective, the European Securities and Markets Authority (ESMA), nowadays constraints ESG-related terms in fund names (European Securities and Markets Authority, 2024)⁶ use, exceptionally by requiring that the characteristics the found state to promote are meet by a numerous share of funds’ assets.

Together, all these layers close the space for the so-called greenwashing, making all the claims verifiable *ex ante* and auditable *ex post*, still with the focus of preventing and preserving capital access for transition-critical activities, when finances thanks to credible use-of-proceeds structures.

Having clear in mind what each layer does, shows why no layer can be sufficient alone. EuGBS has the role to define both a common disclosure grammar and a label at the instrument level; ESMA has the role and the duty to apply discipline in relation to the portfolio, so that funds’ marketing claims are anchored in the asset’s attributes held. ICMA, for instance, supplies the playbook responsible for translating a framework into an impact evidence and reproducible allocation. If an issuer publishes EuGBS factsheet and maps use of proceeds to taxonomy activities, together with clear look-back periods, exclusion, impact reporting and timely allocation but without ESMA’S naming discipline, the related incentive to the buy-side to prefer instruments that are better-documented would weaken. Oppositely, a regime that has a harsh and strict ESMA with lack of instrument-level documentation would lead portfolio managers into high costs bespoke diligence. Lastly, without a harmonised ICMA metrics, the risk of idiosyncratic impact annex becomes tangible.

Due to the overcited reasons, the stack works and functions as a closed system; reporting and instrument design are standardised, demand is regulated and disciplined by name-usage rules and well-evidenced papers are supported and reinforced by market incentives.

⁵ ICMA, Handbook – Harmonised Framework for Impact Reporting, Zurich: International Capital Market Association, 2022, pp. 6–7, 34–36.

⁶ ESMA, Guidelines on Funds’ Names Using ESG or Sustainability-related Terms, Paris: ESMA, 2024, Section 3 “Requirements for ESG-related terms”.

EuGBS mechanics have the role to translate and transform sustainability teams and treasures into tangible workstreams. Thus said, eligibility needs to anchor within the EU taxonomy's technical screening criteria; selection and evaluation require governance that stand scrutiny; impact and allocation reporting must be granular, consistent and timely with the methodologies present and flagged in the framework; management of proceeds need, to allow precise allocation tracking, sub-accounting. It is important to clearly state that external review represent a substantive check on whether eligibility mapping, KPI calculations, refinancing caps and lookbacks are clear and have credibility. As a portfolio increase in complexity, more premium investors will place on sampling logic, calculation trees and conservative attribution rules. Practically, all those frameworks that can pair machine-readable tables (e.g. taxonomy references, KPI assumptions and allocated amount) and narrative PDF can broaden eligible investors base and reduce frictions related to the buy-side diligence.

ICMA's role moved from purely principles to grounded practice. The Harmonised Framework for Impact Reporting deliver a common language for those sectors where, in the past, comparability was seen and perceived as weak, for example water, buildings and energy efficiency. ICMA clearly recommends the issuers to counterfactuals explicitly and disclose baseline (International Capital market Association, 2022)⁷; distinguishing net effects from gross and giving enough evidence corresponding to emissions factors, capacity factors and degradation curves that permits replication. Enabling-projects guidance (ICMA, 2023)⁸ are necessary, they reduce interpretive risk in value-chain financing, requiring the issuers to demonstrate that all the components are fundamental for the auspicial green outcome and that the proportional allocation eliminate the risk of double-counting downstream benefits. Nowadays the threshold for investor acceptance, for corporates and banks is represented by specialised power electronics, financing grid modernisation and efficiency-enabling equipment. This led to a shift in the market, from static to evidence packages easily internalized by reporting systems and internal risk from the buy side.

The loop is closed through the ESMA's fund-naming guidelines that develop and create the demand-perspective constraint. ESG terminology is used for example by the funds to allow the asset mix to reflect the overcited ESG claims; this means and translate into ex-post (European Securities and

⁷ ICMA, Handbook – Harmonised Framework for Impact Reporting, Zurich: International Capital Market Association, 2022, pp. 6–7, 34–36.

⁸ ICMA, Guidance for Green Enabling Projects, Zurich: ICMA, 2023.

Markets Authority, 2024)⁹ reporting and pre-trade compliance that need asset-level evidence. In exchange, instruments that can be eligible, allocated and impacted have the possibility to be tested, downloaded in portfolio systems and previously tested against clear criteria.

Consequently, ESG named funds can easily hold and defend Eu-GBS labelled bonds with alignment from ICMA rather than poor documented “thematic” bonds. As important as this, ESMA states and clarify that all those credible green bonds which are issued by high legacy emissions companies are still compatible with ESG named funds if evidence package is still strong and use of proceeds is genuinely green and not just a matter of greenwashing.

By balancing the tension between a pure focus on the label and the need for transitional mechanisms, (i.e. many companies have some level of green activities going on within them), the Rule Stack allows for capital to be allocated to those aspects of large emitting systems that can accelerate decarbonization most effectively; assuming they have auditable evidence and robust reviews backing their claims. In other words, the Rule Stack is not just defending against green washing; it is allocating capital towards projects that meet an increasingly stringent evidentiary standard.

For Issuers, the key takeaway is that there will be an economic cost associated with providing good quality documentation and a good, structured set of data; specifically, the ability to clearly map taxonomy, transparent information and data around KPI methodology and availability of external review processes with disclosed scope.

Machine readable (European Securities and Markets Authority, 2023)¹⁰ annexes that decrease investors verification costs and increase the number of ESG constrained bidders; in primary markets that has historically shown up as better order book size and more competitive pricing compared to comparable conventional products.

For Investors, the key takeaway is that the choices made upstream regarding labelling and documentation can significantly reduce the operational burden of compliance with naming rules and production of their own sustainability report.

In general, for both parties, there is an emerging "best practice" of a crosswalk (International Capital market Association, 2022)¹¹ that extends from eligibility based on taxonomies to the EU Green Bond Standard Factsheet to ICMA aligned Allocation & Impact Tables to Portfolio Classification under

⁹ ESMA, Guidelines on Funds’ Names Using ESG or Sustainability-related Terms, Paris: ESMA, 2024, Section 3 “Requirements for ESG-related terms”.

¹⁰ ESMA, Sustainable Finance Roadmap 2022–2024: Data & Digitalisation, Paris: ESMA, 2023, pp. 18–20.

¹¹ ICMA, Handbook – Harmonised Framework for Impact Reporting, Zurich: International Capital Market Association, 2022, pp. 6–7, 34–36.

ESMA and ultimately to Reconciliation of Pillar III disclosures by NACE Code and Environmental Objective.

The value of this paragraph is not limited to catalogue the overcited instruments, but to show how instrument integrity and portfolio discipline have created an environment in Europe where credibility at issuance is rewarded by disciplined demand and disciplined demand creates a higher incentive for better documentation and review of green instruments. The result has been a positive feedback loop that has created greater evidence based on investor due diligence and supervisory examination, such that investors can rely more heavily on green claims being supported by credible data. The subsequent sections will further build upon this trend and create a mechanism by which the improvements at the instrument and portfolio level ultimately translate into regulatory-comparable supervisory grade information reported on banks' financial statements (i.e., through the European Banking Authority's Pillar 3 reporting) using the Green Asset Ratio, Banking Book Taxonomy Alignment Ratio and climate risk tables that incorporate sustainability into required prudential reporting.

1.3 Turning environmental promises into measurable data

The previous subchapter showed and demonstrated how portfolio discipline and instrument integrity are important to avoid greenwashing when it comes to distribution and issuance, those claims must end up in Pillar 3; and therefore, for the purposes of supervisory standards, will have to represent equivalent evidence. The EU's EBA has published a ESG Pillar 3 package (European Banking Authority, 2022)¹² requiring all banks within the EU to provide standardized climate and environmental related data, among other things, which includes two headline Key Performance Indicators (KPIs), the Green Asset Ratio (GAR) and the Banking-book Taxonomy Alignment Ratio (BTAR); and qualitative/quantitative climate risk reporting tables relating to governance, strategies, risk management and metrics/targets. These combined disclosures, form the prudential base by converting narrative from labelled bond products into measurable balance sheet representations that can be used to compare issuers and track changes over time.

It is important to understand what GAR and BTAR are and why in pair, they matter; GAR represents the proportion of the bank's exposure to on-balance-sheet assets that meet the EU Taxonomy

¹² European Banking Authority (2022) Implementing Technical Standards on ESG Risk Disclosure under Pillar 3.

(European Commission, 2020)¹³ in the Pillar 3 perimeter (for exposures to non-financial corporates and, subject to certain conditions, mortgage lending). As such, it is naturally limited in its scope (it does not include all relevant areas of a bank's exposure (e.g. many sovereign exposures, positions held in the trading book) and does not regard an asset as being 'aligned' unless the technical screening criteria and 'do no harm' safeguard have been fully satisfied. This strictness facilitates comparable reporting across banks; however, it limits the range of assets that can be regarded as aligned. Thus, if reporting based solely upon GAR is viewed in isolation from other reporting, it may provide an understatement of the rate of transition towards alignment between the existing bank portfolio and the EU taxonomy, especially where there are gaps in available data, or if the alignment of capital expenditures (capex) is expected to occur at some point subsequent to the completion of capex programmes.

BTAR widens (European Banking Authority, 2023)¹⁴ the focus to taxonomy alignment across the banking book, complementing GAR by capturing trajectories of alignment beyond strict GAR parameters. EBA intends for the two to be read together: GAR is the today signal of hard-alignment, BTAR as the coverage and pathway signal as to locations of building alignment which will be reflected in future GAR numerators. This pairing has the effect of improving decision-usefulness for investors who must judge whether labelled issuance is coherent with a bank's development of its portfolio. These ideas are formalised, through EBA, in a set of pre-defined templates, using tabular formats, which provide fixed definitions, boundaries, and instructional content to ensure like-for-like comparison of Pillar 3 Sustainability Reports (and their associated data), as well as cross-bank comparisons over time. It is the rigid structure imposed by these templates that ensures disparate sustainability reports become comparable Pillar 3 reporting packages, suitable for analysts to compare banks, and track the same banks over time.

Beyond the KPI's, The ESG Pillar 3 package mandates qualitative and quantitative disclosures (European Central Bank, 2020)¹⁵ by banks about climate and environmental risks: management responsibilities, board oversight, scenario-analysis methods, risk taxonomies, and exposure breakdown to physical and transition risk drivers. The ECB has stressed that these are the drivers of existing prudential risks, not a separate exercise of corporate social responsibility, since its Guide on

¹³ European Commission, Regulation (EU) 2020/852 ('EU Taxonomy Regulation'), Brussels, 2020, Arts. 3–4 and Art. 9.

¹⁴ EBA, Banking Book Taxonomy Alignment Ratio Technical Note, Paris: EBA, 2023, Section "Methodology".

¹⁵ ECB, Guide on Climate-related and Environmental Risks, Frankfurt: ECB, 2020, Section "Supervisory Expectations".

climate-related and environmental risks: the Guide sets the supervisory expectations for identification, measurement, monitoring, and integration into the management of credit, market and operational risks of climate risks.

The shift in supervisory signalling has also been from guidance towards enforcement. In 2024–25, the ECB stated publicly that those banks that failed to integrate climate risk and disclose, accordingly it will be subject to penalty payments (European Central Bank, 2024)¹⁶ and subsequent reports have shown that notices to pay fines were being sent out to financial institutions that did not comply with the regulations. This clearly implies a direct relationship between the quality of disclosures and the implications for persistently large gaps between what the bank discloses and its actual exposure to climate risks (climate Pillar 3), which reinforces the credibility of the EBA templates as useable information for investors.

It is important to give also a context outside the EU, which extend its roots on Basel’s voluntary framework (Basel Committee on Banking Supervision, 2025)¹⁷, which was finalised by the Basel Committee in June 2025 with a set of guidelines for voluntary disclosure about a company's climate-related risk. The guidelines include both qualitative and quantitative requirements and provide for commonality in disclosure among countries to help cross-border investing by international bank investors. Because it is non-binding and less detailed than what was initially proposed, the guidelines serve as a minimum standard for disclosure among all countries and promote comparability across countries. While EU banks that are required to produce annual reports using EBA templates under Pillar 3 will be able to use this new framework to align their reporting with those of their foreign counterparts, it is primarily an optional reporting tool.

To allow the rule stack to operate and carry out its function as a system, the investors need to be able to check and control the flow of proceeds from an issuer's labelled bond through a bank's portfolios into the available data supporting its claims can be traced. emerging best practices include a crosswalk (International Capital market Association, 2022)¹⁸ between the bank's labelled bond uses of proceeds and EU taxonomy activity areas and NACE codes as well as the bank's allocations to sectors and geographies based on the exposures listed in the bank's Pillar 3 reports. also emerging best practices are the bank's methods and assumptions for calculating KPIs for measuring impacts of labelled investments. when the crosswalk is created in machine readable (European Securities and Markets

¹⁶ ECB, Supervisory Priorities – Climate Risk Enforcement, Frankfurt: ECB, 2024, Section “Enforcement”.

¹⁷ Basel Committee on Banking Supervision, Disclosure Framework for Climate-related Financial Risks, Basel: BIS, 2025, Section “Minimum Disclosure Standards”.

¹⁸ ICMA, Handbook – Harmonised Framework for Impact Reporting, Zurich: ICMA, 2022, pp. 20–25.

Authority, 2023)¹⁹ tables (csv/xlsx) with transparent descriptions of methodology used and, if possible, auditor certifications of how the bank allocated the labelled investment proceeds, then the costs for buy side teams to reconcile labelled bond proceeds with the banks GAR/BTAR will decrease significantly and the link from the Eu GBS/ICMA documentation to the bank's GAR/BTAR will become auditable. It is the EBA requiring standardised templates that allows investors to follow a consistent workflow to verify labelled bond proceeds across all issuers.

Pillar 3 is not an additional parallel compliance pathway for issuers but rather provides a framework that will allow issuers to turn labelled claims into actual figures capable of being reviewed by regulators. In practical terms, Pillar 3 will require issuers to establish alignment among their treasury, financial and risk departments, such that taxonomy/NACE mapping in frameworks and subsequent post-issuance reporting will reflect the same taxonomy/NACE mapping used in Pillar 3 templates; the results of external audits, when applicable, will contain information regarding the scope and methodology used in allocating the proceeds from a bond issue and, if possible, audited allocations at full draw; and lastly the content of the annexes on the impact of green bonds will be structured to allow for the easy consumption of the data by investor systems. Once this alignment can be demonstrated, ESG constrained funds, operating under ESMA's naming requirements, can consider the inclusion of bonds issued by those issuers toward meeting their respective portfolio limits with reduced friction resulting in larger order books and more competitive pricing relative to other conventional securities with equivalent characteristics. Conversely, when claims of allocations made by issuers cannot be aligned with the Pillar 3 tables, or when methodologies for allocating the proceeds of bonds issued are opaque, investors typically reduce the reported impact of their holdings or remove the holdings altogether with negative implications for both the ability to execute trades and secondary market liquidity.

Pillar Three greatly reduces the cost of verifying information for investors; an investor can use a consistent process to verify a bank's information. The process consists of reviewing (European Banking Authority, 2022)²⁰ the following documents in this order: EuGBS Factsheet, ICMA Impact Annex (machine readable), ESMA Portfolio Classification, Pillar Three GAR/BTAR and Climate-Risk Tables. This repeatable process for diligence across banks has been further supported by the ECB's Supervisory Stance: While the ECB expects all banks to comply with the recommendations

¹⁹ ESMA, Sustainable Finance Roadmap 2022–2024: Data & Digitalisation, Paris: ESMA, 2023, pp. 18–20.

²⁰ EBA, Implementing Technical Standards on ESG Risk Disclosure under Pillar 3, Paris: EBA, 2022, Annexes – Workflow and Templates.

outlined in the Guide, they have made clear that if any gaps exist, there will be penalties issued to support compliance, increasing the value of Pillar Three as a credible source of information.

The reliability (European Central Bank, 2024)²¹ of claims at issuance to be delivered on the balance sheet will depend on the assurance level (i.e., the extent to which assurance is performed), the policing of fund name, and the ability of machines to read and follow the lineage of data, all of which are "fault lines" that next paragraph will tackle, using circular economy finance as a high-stress test case for these "fault lines."

1.4 Where credibility still breaks down

The previous paragraphs demonstrated how Europe's "rule stack", EuGBS and ICMA at the instrument level, ESMA's fund-naming discipline at the portfolio level, and Pillar 3 (GAR/BTAR and climate-risk tables) at the prudential level, has tightened the verification chain from label to balance sheet. Yet credibility at scale still hinges on three residual fault lines: the depth and independence of assurance, the discipline with which portfolio labels are policed, and the lineage and machine-readability of data connecting proceeds, impacts, and balance-sheet evidence. These gaps are not theoretical; they are exactly where due-diligence costs rise, where investor confidence wobbles, and accusations of greenwashing gain traction. They are also where circular-economy (CE) financing; by its nature cross-boundary and attribution-sensitive, most sharply tests whether disclosures truly "travel" across the three layers.

The quality of assurance varies across the green bond market and is the major cause of slippage between what an issuer states in terms of its narrative for a project and the evidence provided in the form of proof. By requiring all external reviewers to be registered (European Parliament and Council, 2023)²² and creating standards for pre- and post-issue documentation, EuGBS elevates the minimum acceptable level of assurance depth. ICMA has developed more mature guidance on the use of impact Key Performance Indicators (KPIs) and "green enabling" projects. However, there is still considerable variability in the level of scope of the verification process applied to these two areas of practice. Some issuers obtain narrative second party opinions focused on the design of their respective frameworks; other issuers obtain relatively limited assurance on the allocation of proceeds; and, more rarely, they achieve reasonable assurance over allocation and sometimes reasonable assurance over selected impact indicators. The difference in the type and level of assurance obtained by an issuer

²¹ ECB, Supervisory Priorities – Climate Risk Enforcement, Frankfurt: ECB, 2024, Section "Data Quality and Enforcement".

²² European Parliament and Council, Regulation (EU) 2023/... establishing the European Green Bond Standard, Brussels, 2023, Section "External Reviewers".

does matter. Reasonable assurance regarding allocation provides the assurance that the euros or basis points claimed as "green" were actually allocated to eligible activities. Reasonable assurance regarding impact goes further than this and requires assurance that the calculation tree (International Capital market Association, 2022)²³ upon which the underlying impact measurement was based (i.e., activity data, baselines, counterfactuals, emissions or resource efficiency factors etc.) was built to a standard that would allow it to withstand auditing. When an issuer's portfolio consists of many discrete activities (e.g., tens of thousands of residential retrofit projects), or when there are long causal chains (e.g., enabling components in industrial systems), the lack of assurance will require investors to undertake additional verification work, thereby increasing the likelihood that their positions will either be haircut or excluded from funds that have ESG in their names. On the other hand, when issuers create explicit methodology notes and provide assurance that covers those notes, investor requests for information (RFI) decrease, and positions tend to be more stable during reporting periods. Therefore, in summary, EuGBS establishes the structure or frame for the green bonds, ICMA creates the language or grammar of the green bonds, and the level of assurance achieved by an issuer represents the punctuation that removes ambiguity from the language of the green bonds.

Naming discipline represents another fault line in the process which lies on the demand-side of the process. The naming discipline has been formed because of the fund-naming guidelines (European Securities and Markets Authority, 2024)²⁴ issued by ESMA that have limited "halo" marketing practices for all those funds using ESG-related terminology to demonstrate that they have an amount of their investments that are audited to meet the claims made regarding the investment's ESG related characteristics. The resultant pull is very strong for bonds with auditable substance (i.e., clearly defined eligibility criteria, timely allocation, and Annex-type documentation of the expected environmental impacts) and the change has provided a pragmatic approach to transition; green bonds from high-emitting companies can remain consistent with ESG-named funds as long as there is strong evidence that the bond-issuing company will apply a genuine green use of the proceeds from the bond issue. In this way, the change provides a means of avoiding starving electricity systems, heavy industries and logistics of capital for decarbonization while maintaining honesty in portfolio labelling. The only remaining risk is about heterogeneity in implementation between national authorities and/or asset managers with respect to the strictness used to evaluate compliance with thresholds and exclusions for the instruments within the portfolio. As such, the potential for different treatment

²³ ICMA, Handbook – Harmonised Framework for Impact Reporting, Zurich: ICMA, 2022, pp. 6–7, 34–36.

²⁴ ESMA, Guidelines on Funds' Names Using ESG or Sustainability-related Terms, Paris: ESMA, 2024, Section 3 "Requirements for ESG-related terms".

(European Securities and Markets Authority, 2024)²⁵ of the same instrument between portfolios could create a level of opacity like that existing prior to the creation of the ESG-named fund classification system. A practical method to mitigate the heterogeneity in implementation would be for the issuer to prepare portfolio-ready artifacts (ESMA, 2023)²⁶ (e.g., downloadable allocation and impact tables, explicit Taxonomy mappings, reviewer scope and conclusions) so that the classification of the instrument under ESMA-style policies would become a clerical task rather than a judgement call.

The above fault lines become even sharper in Circular Economy Financing due to the nature of System Boundaries and Attributions being difficult to define and measure. While the European Union has established a taxonomic framework with "Transition to a Circular Economy" as one of its Environmental Objectives, the need for careful measurement to ensure accuracy and integrity of reporting remains. Three common pitfalls (Ellen MacArthur Foundation, 2019)²⁷ are noted that occur when attempting to measure Circular Economy Reporting:

1. **Boundary Effects:** while Design for Durability will potentially decrease the frequency of product replacement (a positive), the increased weight of the durable product may result in an increase in Energy Use during the products life cycle, thus requiring clear definitions of what is included/excluded within the scope of the lifecycle measurement.
2. **Double Counting:** both upstream Suppliers and Downstream Users of a product can each claim the same amount of Virgin Material Avoided (if they meet the criteria) without proof of substitution and/or proper allocation of the substitution, unless it is clearly shown through documentation and quantification that substitution was made.
3. **Rebound/Leakage:** an improvement in Efficiency may lead to lower prices resulting in higher Total Consumption, while Closed Loops can be leaked from country-to-country or from one Waste Stream to another.

The Enabling Projects Guidance (International Capital Market Association, 2023)²⁸ issued by ICMA provides some assistance in avoiding these pitfalls by mandating: Proof of Necessity (why the specific Components are necessary to achieve the desired Circular Outcome), and Proportional Allocation of Components that are used in Multiple End-Uses. However, it is the Issuer's Calculation Tree that is

²⁵ ESMA, Guidelines on Funds' Names Using ESG or Sustainability-related Terms, Paris: ESMA, 2024, Section 3 "Requirements for ESG-related terms".

²⁶ ESMA, Sustainable Finance Roadmap 2022–2024: Data & Digitalisation, Paris: ESMA, 2023, pp. 18–20.

²⁷ Ellen MacArthur Foundation, Completing the Picture: How the Circular Economy Tackles Climate Change, Cowes, 2019, pp. 15–19.

²⁸ ICMA, Guidance Handbook for Green Enabling Projects, Zurich: ICMA, 2023, Section "Necessity and Allocation Rules".

presented in a transparent manner, and if possible, is also audited and assured, which is the final safeguard against excessive claims of Circular Economy outcomes.

Both for investors and for supervisors, the implications are symmetrically aligned. For investors, they should favor the low-cost ways to create the crosswalk as clear fact sheet information, KPIs (aligned to ICMA) and disclosed factor sets, reviewer scopes (clearly stated), and structure data formats; because these are the most cost-effective ways for investors to maintain their investments within an 80% compliance bucket that aligns with ESMA guidelines, and to easily report on them to investors. For supervisors who have created the Pillar 3 framework as the base for the balance-sheet side of the investment chain, supervisors (European Banking Authority, 2022)²⁹ can facilitate a faster alignment of the two sides of the investment chain by promoting the use of structured annexes and by incentivizing banks to provide detailed crosswalks between bonds and their corresponding Pillar 3 data points. As companies develop their digital tagging (European Financial Reporting Advisory Group, 2023)³⁰ of their corporate sustainability statements, the technical obstacles to creating full end-to-end reconciliations will diminish, and the variability will shift from data plumbing to assurance choices and governance issues.

²⁹ ESMA, Sustainable Finance Roadmap 2022–2024: Data & Digitalisation, Paris: ESMA, 2023, pp. 18–20.

³⁰ EFRAG, European Sustainability Reporting Standards – Digital Taxonomy Draft, Brussels: EFRAG, 2023, Section “Digital Tagging Architecture”.

Chapter 2

Engineering integrity in sustainable debt

The previous chapter set up the debt problem as an evidentiary issue. The green label is useful for decision-making only when the claims can be checked, compared, and traced from the issuance story through portfolio limits to the balance sheet proof. In this chapter the objective is to turn that idea into a question. What are the rules, frameworks, and checking steps that allow the claims to be audited in practice and where the rules, frameworks, and checking steps still break. In Europe, the answer is not an instrument or a single standard. The layered architecture includes the labels, market guidelines, portfolio-level naming discipline, and prudential disclosures. Together they create incentives and limit the space for ambiguity. The purpose here is not to restate documents as a catalogue but to explain how regulatory documents work as a system of integrity engineering. At the instrument level frameworks and disclosure artefacts turn sustainability intent into use-of-proceeds commitments, eligibility logic, management of proceeds, and reporting obligations. At the market practice level, guidance on allocation and impact reporting determines whether environmental outcomes are reported transparently to be replicable. At the portfolio level, the naming rules and fund-label constraints turn the quality of disclosure into a filter that operates on the demand side. The naming rules and the fund-label constraints make instruments that do not follow them harder to hold, harder to market, and, over time, less liquid.

At the level, the standard templates turn what might otherwise stay as narrative into numbers that let supervisors monitor across issuers. The core claim of the thesis is that credibility grows when the naming rules and the fund-label constraints, and the standard templates help each other work side by side. Credibility grows. This chapter connects the trust gap idea with the tests that follow later in the thesis. The steps include what must be documented before we issue, and how the proceeds must be tracked, including what reporting allocation means versus impact; how external reviewers and assurance models give confidence; and why data structure and machine readability are more important for investor diligence. When I look at it, the focus is not compliance. The focus also looks at how compliance changes behaviour. Compliance costs are borne by issuers and investors. Compliance decides which securities can fit mandates. It also changes the verification burden that sits behind pricing and demand. Finally, this chapter is where the thesis is deliberately stress-tested. Even a strong rule stack has fault lines. Assurance depth may vary. Naming discipline may be uneven. Data lineage may break when disclosures are not structured or compatible. Circular-economy financing is used as a high-pressure example because it shows problems, showing attribution risk and counts more clearly than simpler mitigation projects. By the end of the chapter, it should be clear the

operational understanding of what “integrity” means in the European sustainable debt market: not a slogan, but a set of design choices, disclosure practices, and verification pathways that determine whether “green” is marketing or evidence.

2.1 The new architecture of rules

The shift in the European debt market during 2024 and 2025 moved the sector from soft rules to a practical rulebook (European Parliament and Council, 2023)³¹. This rulebook changed what issuers must document, what investors can verify at lower cost, and what portfolio managers can credibly defend. The change was not simply the result of additional guidance from regulators and standard setters; rather, it reflected a deeper shift in the treatment of sustainability claims as matters of market integrity. Information supporting sustainability claims often became inconsistent, hard to compare, or difficult to audit (European Court of Auditors, 2021)³², thereby increasing verification costs and strengthening incentives for selective disclosure. The likelihood that green claims would function more as marketing than as decision-useful evidence also increased. The rulebook that consolidated during this period can be read as a direct response to these structural issues, particularly the combination of fragmented standards, uneven external review practices, and the rapid growth of labelled products distributed to investors through fund names and marketing channels where labels frequently serve as shortcuts.

Three constraints became especially influential, and together they formed the practical rulebook for Europe’s sustainable debt market in 2024–2025. At the instrument level, the European Green Bond framework introduced a regulated designation (European Securities and Markets Authority (ESMA), 2024)³³ with a prescribed disclosure sequence and a defined verification layer (European Securities and Markets Authority (ESMA), 2023), transforming the use of proceeds from a narrative promise into a traceable commitment. At the market-practice level, ICMA’s updated principles, guidance handbooks, and impact reporting frameworks continued to provide the reporting guidelines, especially where law alone could not standardise sector metrics or methodological choices without becoming excessively granular. On the demand side, ESMA’s fund-naming discipline tightened the economics (European Securities and Markets Authority (ESMA), 2024)³⁴ of portfolio labelling by

³¹ European Parliament and Council, Regulation (EU) 2023/2631 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds, Official Journal of the European Union, 30 November 2023, Recitals 5–8, pp. 3–4.

³² European Court of Auditors, Sustainable Finance: EU Action Needs Better Targeting, Coordination and Monitoring, Special Report 22/2021, pp. 14–16.

³³ Regulation (EU) 2023/2631, Articles 4–8 and Annex I, OJ 2023, pp. 6–7, 55–57.

³⁴ ESMA, Guidelines on Funds’ Names Using ESG or Sustainability-related Terms, 2024, paras 4–6, 16–18, pp. 2–3, 8–9

requiring ESG- and sustainability-related terms in fund names to be supported by quantified thresholds and specific exclusions, and by articulating supervisory expectations for compliance monitoring across the fund lifecycle. Taken together, these components operated as a single integrity system (OECD, 2022)³⁵: they raised the cost of weak disclosure and weak assurance while increasing the value of structured, interoperable evidence packages; especially for financial institutions whose claims increasingly needed to be reconcilable with regulatory reporting and supervisory scrutiny.

Treating these instruments as a system, rather than as isolated documents, clarified what became operationally different after 2024. Sustainable debt credibility increasingly relied on standardised pre-issuance artefacts that were easier to compare, post-issuance reporting that was progressively treated as non-negotiable for credibility (Climate Bonds Initiative, 2025)³⁶, and portfolio naming constraints that converted documentation quality into an investability filter (Morningstar Sustainalytics, 2024)³⁷. The market thereby moved toward a regime in which integrity was not merely an abstract attribute, but an observable property reflected in documentation depth, data structure, reviewer scope, and the ability to trace proceeds and outcomes through workflows robust enough to withstand investor due diligence and regulatory checks.

The instrument layer mattered because it changed what it meant to make a sustainability claim in a bond framework, investor presentation, or use-of-proceeds narrative. Market maturation demonstrated that the credibility of use-of-proceeds depended on the quality of supporting artefacts. When frameworks and fact sheets were non-standardised, and when allocation reporting varied in depth and format, investors faced significant heterogeneity (ESMA, 2023)³⁸ and were forced to perform bespoke diligence for each issuer: an expensive process that pushed markets back toward reputation and trust rather than proof. The regulated European Green Bond pathway directly targeted this issue by imposing uniform disclosure requirements and embedding templates intended to facilitate comparability and lower assessment costs. For frequent issuers, the consequences were organisational and communicative: sustainability teams, treasury, legal, and reporting functions were driven toward repeatable workflows because credibility and compliance increasingly required the production of the same structured objects over time.

³⁵ OECD, *ESG Ratings and Investment: The Trust Gap*, 2022, pp. 32–36.

³⁶ Climate Bonds Initiative, *Post-Issuance Reporting in the GSS+ Market*, 2025, pp. 1–3.

³⁷ Morningstar Sustainalytics, *ESG Funds Under ESMA Naming Rules: Market Impacts*, 2024, pp. 4–6.

³⁸ ESMA, *TRV Report No. 1/2023*, pp. 54–57.

The market-practice layer was important because even the strongest legal designation could not fully resolve the most difficult measurement problems (Network for Greening the Financial System (NGFS), 2023)³⁹. Legal requirements might specify reporting obligations, disclosure artefacts, and reviewer involvement, yet investors still required interpretability: how impacts were calculated, which baselines were used, how net effects differed from gross effects, and how enabling activities were treated where causal chains were indirect. ICMA’s Principles and handbooks continued to function as a disclosure canon in this respect, providing a shared vocabulary and a set of expectations that could be applied across issuer types and sectors, enabling comparability even where legal frameworks differed across jurisdictions or where issuers did not adopt the highest-standard legal label. A core feature of this canon was its status as voluntary guidance operating alongside applicable laws; this allowed the principles to coordinate market practices without attempting to substitute for regulation. In practice, the ICMA layer provided the applied reporting “grammar,” while the EU Green Bond framework provided a legally binding label with prescriptive disclosure requirements.

The demand-side layer was significant because sustainable debt markets scaled when distribution and portfolio construction scaled. Fund names were not neutral descriptors; they were part of marketing and investor communication, and they frequently shaped investor expectations at the point of allocation. Where ESG and sustainability terms were used, the implied promise was that holdings meaningfully reflected the characteristics or objectives suggested by the name. ESMA’s naming discipline therefore, acted as both consumer protection and market structure policy. By introducing quantified thresholds and exclusions and by specifying supervisory expectations throughout a fund’s life, the guidelines raised the compliance and reputational cost of holding instruments that could not be defended with evidence. A labelled bond with weak reporting or unclear eligibility became operationally costly because it increased compliance friction, required additional manual diligence, and raised the risk of later reclassification. Conversely, a bond supported by structured reporting, clear mapping logic, and credible external review became easier to ingest into portfolio systems and easier to justify under naming constraints.

The operational significance of the 2024–2025 rulebook was heightened by its time-bound nature. Application dates and phase-in timelines converted the rulebook from aspirational guidance into actionable constraints. The European Green Bond regime applied from a specified date; ESMA’s naming guidelines applied with an implementation schedule distinguishing between new and existing

³⁹ NGFS, Handbook on Climate Transition Metrics, 2023, pp. 19–22.

funds. These timelines mattered because they generated predictable escalation: issuers and asset managers could anticipate when expectations would become binding and could adapt disclosure, reporting, and portfolio processes accordingly. In practice, this accelerated the transition from narrative documentation to structured evidence packages, because the cost of being late was not merely reputational, it became exclusion from constrained investor pools and increased supervisory attention.

Once these layers were analysed as a single system, the mechanism linking regulation and guidance to economic outcomes became clearer. The central economic cost in sustainable debt was not only the cost of capital; it was the cost of verification. When verification was expensive and idiosyncratic, markets could not efficiently distinguish high-integrity instruments from low-integrity instruments without over-investing in diligence. That reduced scalability and increased the payoff to marketing-oriented strategies. A system built on templates, recurring reporting expectations, and a common disclosure grammar reduced verification costs (European Banking Authority (EBA), 2022)⁴⁰ and increased the likelihood that markets would reward credible disclosure. This was also why machine-readability and structured annexes became strategically relevant (EFRAG, 2024)⁴¹. These were not aesthetic choices; they were operational choices that determined whether holdings could be processed efficiently by buy-side compliance functions and reporting systems.

Within this system, ICMA's role was often underestimated. The emergence of a legal label did not automatically render market standards secondary. The legal label provided the compliance spine; the market standard provided the operational muscle, especially in reporting. Investors needed to compare not only where the money was allocated, but also what impacts were generated and how those impacts were calculated. The ICMA reporting frameworks positioned impact reporting as a structured practice with core principles, sector metrics, and templates that could be adapted across issuer types. This made disclosure packages investor-usable across sectors and reduced interpretive variance without requiring law to micromanage every metric and methodological choice.

ESMA's naming discipline then closed the loop by turning documentation choices into demand constraints. The guidelines articulated not only thresholds but also supervisory expectations for monitoring and for handling deviations over time. Naming discipline was therefore not a one-time classification exercise; it operated as a continuous constraint that tied the stability of holdings to

⁴⁰ EBA, ITS on ESG Risk Disclosures under Pillar 3, 2022, pp. 10–15.

⁴¹ EFRAG, ESRS Digital Taxonomy Exposure Draft, 2023, pp. 4–6.

ongoing evidence quality. Instruments that could not sustain periodic reporting, allocation clarity, and defensible eligibility mapping became more likely to be excluded or discounted during reporting cycles. Instruments supported by robust evidence artefacts became more stable in portfolios (Amundi Asset Management, Paris)⁴² because they reduced the operational burden of defending holdings under naming rules.

The combined effect was that “integrity” became operationalizable. It could be observed and assessed through the existence and completeness of pre-issuance artefacts, the depth and timing of post-issuance allocation and impact reporting, the scope and independence of external review, and the degree to which evidence was traceable and reusable across portfolio constraints and reporting systems. This operationalisation was essential for an empirical, partially experimental research design: the rulebook generated observable variation in documentation and assurance, and that variation could be tested against later market outcomes (Flammer, 2021)⁴³, such as order books, pricing, investor base composition, and portfolio inclusion or exclusion.

A strategic interpretation also followed. The rulebook did not merely aim to prevent greenwashing; it also sought to preserve access to capital for transition-critical activities by clarifying the conditions under which credibility could be demonstrated. Where evidence was strong and structured, complex issuers and transition-heavy sectors could access sustainable debt markets without relying predominantly on reputational narratives, because the investment case became defensible through documentation. Where evidence was weak, the same issuers became fragile to scepticism and to demand exclusion as naming discipline and regulatory scrutiny tightened. For issuers, the trade-off became explicit: investing in disclosure infrastructure and assurance depth had an upfront cost, but it could reduce long-run capital access frictions by widening the set of constrained buyers willing and able to hold the instrument. For investors and portfolio managers, stronger evidence reduced diligence burdens and lowered the risk of forced reclassification or reputational damage later.

For these reasons, the 2024–2025 “rulebook” is best read as a functional chain rather than as separate compliance requirements. The instrument layer produces standardised evidence objects; the ICMA layer makes those objects comparable and interpretable; the ESMA layer converts comparability into enforceable demand-side discipline. The subchapters that follow unpack each layer and show how,

⁴² Amundi Asset Management, ESG Fixed Income Market Review 2024, pp. 22–24.

⁴³ Flammer, C., “Corporate Green Bonds”, *Journal of Financial Economics*, 142 (2021), pp. 507–508.

in practice, they jointly convert “green” from a marketing descriptor into a claim that can be checked, compared, and defended in real issuance and portfolio workflows.

2.1.1 Starting from voluntary promises to enforceable standards

To summarize, the European Sustainable Debt Rulebook, created new expectations regarding sustainability disclosures and the legitimacy of labelled products. At the centre of this larger architecture, the European Green Bond Standard (EuGBS) developed as the central regulatory instrument (European Parliament and Council, 2023)⁴⁴ that attempted to make credible the use-of-proceeds principle at the instrument level. Although green bond markets experienced a high degree of expansion over the last decade, the use-of-proceeds model that formed the basis of these markets typically allowed for wide-ranging interpretations of proceeds, heterogeneity in reporting practices and varying degrees of intensity and independence in external review processes (ESMA, 2023)⁴⁵.

By introducing a formally designated model of use-of-proceeds, which mandated more specificity, verifiability, and enforcement of claims, the EuGBS has given "teeth" to the use-of-proceeds model (European Parliament and Council, 2023)⁴⁶. By mandating the use of a standardized format for use-of-proceeds disclosures, the role of external reviewers became subject to supervision, and the mapping of eligible activities to the EU Taxonomy became compulsory, rather than optional.

For instance, there were three major structural failures that characterized the development of early labelled-bond markets (European Court of Auditors, 2021)⁴⁷: a lack of comparability in the narratives underlying these markets; heterogeneity in reporting practices that increased verification costs; and a lack of enforceable alignment between claims made before a bond's issuance and evidence of those claims post-issuance.

Against this background, the EuGBS was established as a corrective mechanism to address these issues. The EuGBS established a binding model of how issuers must represent their sustainability narrative, translate that narrative into operational documents, and demonstrate the realization of that

⁴⁴ European Parliament and Council, Regulation (EU) 2023/2631 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds, Official Journal of the European Union, 30 November 2023, Recitals 5–7, pp. 3–4.

⁴⁵ European Securities and Markets Authority (ESMA), ESMA Report on Trends, Risks and Vulnerabilities, No. 1, 2023, pp. 54–57.

⁴⁶ Regulation (EU) 2023/2631, Articles 4–8 and Annex I (factsheet requirements), OJ L, pp. 6–7 and 55–57.

⁴⁷ European Court of Auditors, Sustainable Finance: EU Action Needs Better Targeting, Coordination and Monitoring, Special Report 22/2021, pp. 14–16.

narrative to both investors and regulators. This model represents a move away from principles-based issuance towards evidence-based issuance (OECD, 2022)⁴⁸. Early frameworks emphasized issuer discretion and voluntary alignment with recognized standards; the EuGBS emphasizes traceability, methodological transparency, and auditable documentation.

The "teeth" of the EuGBS begin with the pre-issuance documentation. Issuers are required to develop a fact sheet that is structured according to Annex I of the Regulation (European Parliament and Council, 2023)⁴⁹ and is based on a standardized template. Unlike the general sustainability descriptions found in early frameworks, the fact sheet must map each category of intended expenditure to the relevant technical screening criteria (European Commission, 2020)⁵⁰ found in the EU Taxonomy. Additionally, the mapping must indicate whether the funded activities are aligned with the EU Taxonomy or only eligible for the EU Taxonomy, and whether the anticipated impacts can be measured at the time of issuance or only after the project has been implemented.

These templates serve two purposes. They first reduce the interpretive variation by mandating methodological transparency: issuers may no longer provide generic sustainability descriptions because each activity must be specifically linked to a taxonomy criterion. Second, the templates establish continuity between the pre-issuance and post-issuance reporting of the issuer, providing a document that can be referenced as a basis for subsequent verification. Consequently, the EuGBS diminishes the degree of discretion that issuers previously enjoyed when deciding what to disclose and how to organize their frameworks.

In addition to changing the way issuers organize themselves internally, the factsheet requirement also changed the degree of coordination required between different functional areas of the issuer. Prior to the establishment of the EuGBS, sustainability or treasury teams typically prepared frameworks with little to no coordination across departments. However, due to the high degree of granularity required in the fact sheet; particularly with respect to technical screening criteria, DNSH (Do No Significant Harm) assessments and minimum safeguards, the EuGBS requires issuers to coordinate efforts across multiple departments including compliance, legal, finance and operations (ICMA, 2024)⁵¹. This interdepartmental coordination is perhaps the largest innovation of the EuGBS: it embeds

⁴⁸ OECD, *ESG Ratings and Investment: The Trust Gap*, 2022, pp. 32–36

⁴⁹ Regulation (EU) 2023/2631, Annex I — EuGB Factsheet Template, pp. 55–57.

⁵⁰ European Commission, *EU Taxonomy Regulation (Reg. 852/2020)*, Annex I–III, Technical Screening Criteria.

⁵¹ ICMA, *The Principles Guidance Handbook – June 2024*, pp. 12–13 (governance, internal processes, multidisciplinary involvement).

sustainability data into the operational processes of the issuer, thereby increasing the probability that claims made at issuance reflect operational realities.

The second layer of discipline established by the EuGBS relates to the external review process. The external review process has historically been plagued by uneven practices, pricing structures that incentivized shallow reviews, and a lack of supervisory oversight. The EuGBS addresses these shortcomings by requiring pre-issuance and post-issuance external reviews performed by entities that are registered and supervised by ESMA. Reviews must demonstrate a competent methodology, independence and proper internal controls. The regulation also specifies what reviewers must assess, how the results of their assessment must be stated and what aspects of the issuer's framework must be evaluated for compliance with the standard. Thus, the EuGBS converts external reviews from a market-driven product into a supervised assurance function. Supervision by ESMA enhances the credibility of the review process and reduces the probability that issuers select less rigorous reviewers to receive favourable opinions. The introduction of reviewer liability and mechanisms for ESMA intervention strengthen the reliability of external reviews.

The allocation reporting requirements established by the EuGBS constitute the most operationally intensive obligation imposed by the regulation. Issuers must submit an allocation report to regulators within 12 months of the issuance date and annually thereafter until the proceeds have been fully allocated. The allocation report must detail the allocation of proceeds to individual projects using NACE codes and taxonomy activity. The report must also distinguish between proceeds used for capital expenditures, operating expenditures and financial investments, and it must identify any proceeds that have not been allocated to specific projects and are being retained in cash or in temporary investment vehicles. The allocation report must also be accompanied by external assurances, which ensure that the allocation of proceeds reported by the issuer accurately reflects the actual financial flows and that the methods used to attribute and allocate proceeds are transparent and replicable.

Reporting on the impacts of taxonomy-aligned activities is also required under the EuGBS, although the regulation does not mandate specific Key Performance Indicators (KPIs). Rather, the regulation requires issuers to provide sufficient information so that investors may understand how impacts were calculated and assess the credibility of those calculations. In this regard, the EuGBS relies on the ICMA reporting canon for specification of methodology details, while providing a legal basis for the frequency of reporting, the involvement of external reviewers and the mandatory inclusion of Taxonomy-related metrics in reporting. This dual approach of prescriptive allocation reporting and

semi-prescriptive impact reporting was purposefully chosen to maximize comparability while allowing for sectoral differences.

The enforceability of EuGBS is enhanced by its compatibility with other elements of the EU rule stack. Because the standard is anchored in the EU Taxonomy, it directly contributes to the data streams feeding into ESMA-supervised fund disclosures and into EBA's Pillar 3 templates (EBA, EBA)⁵². When issuers categorize expenditures based on NACE codes and technical screening criteria at issuance, they facilitate downstream investor reporting and improve the accuracy of classification under ESMA's nomenclature. Similar to this, when the issuer is a bank, EuGBS-compliant allocation data may be reconciled with GAR and BTAR metrics, thereby enhancing the coherence of disclosures in sustainable debt markets and prudential reporting.

This interoperability is central to the "teeth" of EuGBS. Use-of-proceeds claims are not solely confined to the documentation associated with the bond itself but are part of a regulatory data stream that influences portfolio construction, supervisory monitoring and balance-sheet-level reporting.

While the economic implications of EuGBS for issuers are substantial, including increased costs of issuance due to additional data collection, internal coordination, external review and reporting, the benefits of compliance often manifest in the form of increased investor confidence, larger order books and, in some instances, lower pricing compared to comparable conventional bonds. Studies conducted by S&P Global Ratings suggest that well-documented and externally reviewed green bonds attract greater numbers of ESG-focused investors (S&P Global Ratings, 2023)⁵³, leading to broader distribution and tighter pricing. The structured nature of EuGBS disclosures facilitates the classification and defense of bonds within ESG funds and decreases the risk of the bonds being excluded from portfolios during reporting periods. For issuers with complex business models or higher baseline emissions, the EuGBS creates a path for demonstrating credibility without reliance on voluntary claims or reputation-based signaling.

From an investor perspective, EuGBS reduces verification costs and enhances confidence in the persistence of green claims. Since disclosures are standardized and external reviewers are subject to regulatory oversight, investors may more easily compare instruments and rely on external review as a substantive filter, rather than simply as a symbolic representation of issuer commitment.

⁵² European Banking Authority (EBA), ITS on ESG Risk Disclosures under Pillar 3, 2022, pp. 10–15.

⁵³ S&P Global Ratings, Green Bond Pricing in the Primary Market: H1 2023 Update, S&P Global, 2023, pp. 3–6.

Consistent with the findings presented in Chapter Three, verification costs are the primary economic incentive for maintaining integrity (Climate Bonds Initiative, 2025)⁵⁴ in sustainable debt markets. The EuGBS reduces these costs by establishing standardized documentation that enables investors to systematically evaluate eligibility, allocation and impacts without conducting bespoke diligence for each issuer.

Additionally, the introduction of EuGBS is likely to reshape market expectations, extending beyond the boundaries of the standard itself. Many issuers that do not utilize the EuGB designation will modify their frameworks to mirror the structure of the EuGBS, anticipating that investors will favour documentation that conforms to the regulated model. This "shadow adoption" effect has already been observed in other areas of sustainable finance, including the influence of EU Taxonomy criteria on voluntary market taxonomies (BloombergNEF, 2024)⁵⁵. Over time, the EuGBS will likely elevate the minimum standard for green bond documentation, regardless of whether issuers elect to utilize the EuGB designation, in a manner analogous to how the GDPR elevated global data governance standards.

Finally, the "teeth" of the EuGBS are also derived from the consequences of non-compliance. The regulation contains provisions that allow the designation to be revoked if issuers fail to comply with reporting obligations or if external reviewers identify significant defects in the framework. Revocation of the designation carries reputational risks and can limit access to ESG-constrained capital pools. For issuers that issue large numbers of green bonds, failure to maintain compliance across multiple years can damage investor confidence and reduce the long-term value of their sustainable finance strategy. The threat of regulatory action against issuers that engage in strategic under-reporting or selective allocation reporting will also discourage these behaviors.

At a systemic level, the EuGBS will contribute to the transformation of sustainable finance from narrative-based markets to evidence-based markets. While the use-of-proceeds model remains a fundamental component of the sustainable finance market, the EuGBS transforms it into a mechanism that produces regulatory-quality data. This data will enable better supervision of sustainable finance markets, improve the consistency of portfolio classification, and decrease the informational asymmetries that exist between issuers and investors. The linkage of the EuGBS with the taxonomy criteria and NACE codes will also enable the data produced by the EuGBS to be utilized in broader

⁵⁴ Climate Bonds Initiative, Post-Issuance Reporting in the GSS+ Market, 2025, pp. 1–3.

⁵⁵ BloombergNEF, Sustainable Finance Market Outlook 2024, pp. 15–18.

regulatory initiatives including corporate sustainability reporting standards (CSRD/ESRS) and supervisory climate-risk assessments by the ECB.

Linking the EuGBS with the prior discussion on the design of the European rule stack highlights the intentional design of the rule stack. In Chapter One, the rule stack was defined as an architecture comprised of instrument-level discipline, portfolio-level discipline and prudential-level discipline. The EuGBS constitutes the foundational element of the instrument-level discipline. The EuGBS provides the structured evidence that may be reused across the portfolio construction and supervisory reporting stages. Absent the EuGBS architecture, the integrity mechanisms described in the portfolio and prudential stages would be based on incomplete and non-comparable data, thereby reducing their effectiveness. Therefore, the "teeth" of the use-of-proceeds model arise not only from the standard itself but from the position of the standard in a broader regulatory system that rewards evidence and punishes opacity.

The EuGBS will also shape real-economy outcomes. Because the alignment with the Taxonomy often requires verifiable adherence to environmental performance criteria, the EuGBS indirectly encourages issuers to select projects that may satisfy these criteria, thereby affecting the direction of capital allocation. If issuers wish to include transitional activities in their projects, they must also demonstrate a credible transition pathway, DNSH compliance and minimum safeguards (European Commission, 2023)⁵⁶. The EuGBS will prevent the dilution of green claims and minimize the risk that transitional or enabling activities are misrepresented as green without adequate justification. Therefore, the EuGBS will contribute to the overall objective of aligning capital markets with the EU's climate and environmental goals by incorporating environmental performance criteria into the issuance process.

Finally, the EuGBS establishes a platform for potential future regulatory developments. The templates, reviewer requirements and taxonomy linkages established by the EuGBS may be expanded as the Taxonomy develops to include additional sectors and environmental objectives, including circular economy, biodiversity and pollution prevention. The EuGBS provides a regulatory base upon which future sustainable bond categories, such as social bonds or sustainability-linked instruments, may be constructed with equivalent levels of rigour if regulators elect to expand the model. This forward-looking capability ensures that the use-of-proceeds model will continue to be applicable as technology, environmental and disclosure expectations evolve.

⁵⁶ European Commission, EU Taxonomy Compass — Technical Screening Criteria, 2023 Update, pp. 9–12.

In conclusion, the EuGBS implements the "use-of-proceeds with teeth" by converting voluntary issuance practices into regulated, evidence-based processes. The EuGBS mandates the creation of pre-issuance templates, supervised external review, mandatory allocation reporting and structured impact reporting, all of which enhance traceability and reduce verification costs. Importantly, the EuGBS links the instrument-level disclosures with broader regulatory architectures, facilitating downstream portfolio classification, investor reporting and prudential data alignment. This systemic integration enhances the accountability of issuers, increases market integrity and improves the credibility of sustainable debt markets. As noted in the prior chapter, the credibility of sustainable finance depends on how evidence is transferred across layers. The EuGBS ensures that the transfer of evidence commences with disciplined, auditable use-of-proceeds claims, that may be relied upon by investors, regulators and supervisors throughout the lifecycle of the instrument.

2.1.2 Making “use of proceeds” auditable

The European Green Bond Standard has provided an opportunity to transform the use-of-proceeds methodology into an audit-backed mechanism for generating evidence to support regulatory, supervisory, and portfolio-level validation. However, the transformation of the use-of-proceeds methodology does not occur in isolation. Even highly prescriptive regulatory frameworks require consistent methodological choices, comparative reporting standards, and a shared language for measuring environmental impact (International Capital Market Association, 2023)⁵⁷. This is the juncture at which the International Capital Markets Association (ICMA) enters the rule stack (International Capital Market Association, 2024)⁵⁸. While the EuGBS establishes the legal foundation for credibility, ICMA establishes the operational grammar through which market participants translate, structure, and compare disclosures. Specifically, the EuGBS mandates what must be disclosed, and the ICMA Guidelines mandate how disclosures must be articulated, structured, and interpreted across issuers, sectors, and geographies.

Each of the three dimensions of the thesis integrity lens: Traceability, Comparability, and Replicability; are supported by market guidelines that go beyond what regulation alone can deliver (OECD, 2022)⁵⁹. While the EuGBS provides templates for pre-issuance and post-issuance reporting, it does not establish the methodological assumptions necessary to generate comparable impact metrics. Sector-specific Key Performance Indicators (KPIs), emissions factors, baselines,

⁵⁷ ICMA, Harmonised Framework for Impact Reporting — June 2023, Zurich: ICMA, 2023, pp. 6–11.

⁵⁸ International Capital Market Association (ICMA), Green Bond Principles — June 2024, Zurich: ICMA, 2024, pp. 5–9.

⁵⁹ OECD, ESG Ratings and Investment: The Trust Gap, Paris: OECD Publishing, 2022, pp. 32–36.

counterfactuals, or degradation curves (critical elements of impact measurement) are too dynamic, technical, or sector-specific to be codified in law. Instead, market standards fill this methodological gap, offering a framework for comparability across the market and the flexibility needed for sector-specific nuances.

The significance of voluntary market guidelines within the rule stack stems from the limitations of legal instruments. Regulations define boundaries and obligations, but methodologies for measuring impact must adapt to evolving scientific knowledge and industry practice. As a result, the EuGBS intentionally relies on these flexible, voluntary standards for both allocation of proceeds and impact reporting, recognizing that guidance developed by practitioners can evolve more quickly than legislation (European Commission, 2021)⁶⁰. Investors also use these conventions to interpret disclosures across both EuGBS labelled and non-EuGBS labelled debt securities, making such guidelines the de facto reporting standard for the global green bond market.

A key element in the rule stack is the articulation of foundational principles for green bonds (International Capital Market Association, 2024)⁶¹: use of proceeds, project evaluation and selection, management of proceeds, and reporting. These principles underpin nearly every market framework and have been widely adopted by sovereigns, financial institutions, and corporations globally. Even with the emergence of the EuGBS, these principles remain relevant as a universal language across jurisdictions. Familiarity with these frameworks allows investors to navigate disclosures with ease, as the structure of EuGBS reporting aligns with established market conventions. This consistent structure across regulated and voluntary markets helps reduce the costs of due diligence and enables investors to efficiently assess disclosures, the involvement of reviewers, and the presentation of impact.

Additionally, voluntary market standards reduce the variability in interpretation of disclosures, particularly in sectors characterized by complex causal chains, such as renewable energy, energy efficiency, digital infrastructure, or enabling technology projects. In the absence of such commonly accepted guidelines, issuers would have significant discretion in defining baselines, counterfactuals, or methodologies for calculating impact, which could result in disclosures that are formally compliant but difficult to compare in practice. Divergence in methodology, whether deliberate or unintentional, results in increased friction, decreased comparability, and increased verification costs for investors

⁶⁰ European Commission, EU Green Bond Standard – Impact Assessment, SWD(2021) 181 final, pp. 14–15.

⁶¹ ICMA, Green Bond Principles — June 2024, Annex I, pp. 10–13.

(European Securities and Markets Authority, 2023)⁶². Standardization through these market-driven frameworks minimizes the risk of divergent methodologies by specifying common elements, such as recommended KPIs, baselines, emissions factors, and documentation structures to facilitate comparability.

A further dimension of market influence comes from sector-specific templates developed through technical working groups. These templates address areas of greatest methodological uncertainty, including renewable energy, green buildings, water systems, and low-carbon transportation (International Capital Market Association, 2023)⁶³. Over time, such frameworks have evolved toward a more granular, quantitative approach to reporting on impact, with issuers expected to report on the underlying activity data, the assumptions behind methodological choices, and the evidence supporting the calculation of avoided or reduced emissions. Additionally, these frameworks provide guidance on distinguishing gross from net effects, helping investors avoid overstating the impacts of investments when counterfactuals are not properly defined.

Additionally, industry guidance handbooks further reinforce the expectations created by these frameworks by providing interpretive guidance, best-practice recommendations, and methodological clarifications. These resources address complex issues such as life-cycle boundaries, enabling project attribution, value-chain allocation, refinancing limits, review periods, and the documentation of sampling logic for issuers with large, diverse portfolios (International Capital Market Association, 2024)⁶⁴. Such methodological clarifications are critical for integrity and comparability, as they enable due diligence, replication of issuer calculations, and comparison of disclosures among issuers.

For labelled debt instruments to be considered credible, independent third parties (investors, auditors, regulators) must be able to reproduce the issuer's calculations and validate their credibility (Association of Chartered Certified Accountants, 2023)⁶⁵. ICMA Guidelines facilitate this by requiring issuers to disclose the constituent parts of their calculations, rather than simply disclosing the headline impact numbers. Where issuers provide detailed methodological notes aligned with ICMA recommendations, verifications become practical and cost-effective. Where issuers fail to

⁶² European Securities and Markets Authority (ESMA), Trends, Risks and Vulnerabilities Report – No. 1/2023, Paris: ESMA, 2023, pp. 54–57.

⁶³ ICMA, Sector-Specific Impact Reporting Metrics — Technical Working Group Compendium, ICMA: 2023, pp. 4–18.

⁶⁴ ICMA, Principles Guidance Handbook — June 2024, Zurich: ICMA, 2024, pp. 22–31.

⁶⁵ ACCA (Association of Chartered Certified Accountants), Assurance in Sustainable Finance: Market Practices and Gaps, London: ACCA, 2023, pp. 10–14.

follow these conventions, investors incur greater verification costs and may discount the credibility of the disclosures or exclude the instrument from ESG-constrained portfolios.

ICMA Guidelines also mitigate the issue of enabling-project attribution. Enabling projects: i.e., projects that indirectly support environmental outcomes by providing systems, infrastructure, or technology that are risky for issuers to claim inflated impact, as the causal relationships between the project and environmental outcomes are indirect and extend beyond the issuer's immediate operations. ICMA's enabling-project attribution Guidelines set two critical conditions for attributing impacts to enabling projects: the proof of necessity (the component must be essential to achieving the environmental outcome) and the proportionate allocation (the share of the claimed impact must correspond to the project component's contribution, not the total outcome) (International Capital Market Association, 2023)⁶⁶. ICMA's Guidelines, therefore, help to limit the risk of double-counting, overstatement, and unverifiable claims related to impacts.

ICMA Guidelines also provide a means to deal with the "boundary effects" and "rebound effects" discussed in Chapter Three in relation to financing circular economies. Although the EuGBS provides the statutory basis for taxonomic alignment, it is ICMA that supplies the operational tools for addressing the methodological challenges associated with circular economy metrics (Ellen MacArthur Foundation, 2019)⁶⁷. For example, ICMA recommends that issuers clearly define system boundaries, disclose their assumptions regarding substitution effects, and provide sensitivity analyses when consumer behavioural responses may impact the environmental outcome. These recommendations therefore protect issuers from claiming circular economy benefits without considering the potential negative consequences of leakage, rebound, or partial system-level effects.

It is also important to recognize the role of the ICMA Guidelines in market enforcement. Although ICMA is a voluntary standard-setting organization, the market treats ICMA Guidelines as quasi-mandatory. Asset managers are subject to ESMA's fund-naming disciplines and must demonstrate that their ESG-labelled holdings meet specific sustainability criteria. Since ICMA Guidelines are easier to identify and verify, instruments that conform to them enjoy greater market recognition and lower compliance friction (Morningstar Sustainalytics, 2024)⁶⁸. Instruments with non-standardized

⁶⁶ ICMA, Enabling Projects — Technical Guidance Note, 2023, pp. 7–12.

⁶⁷ Ellen MacArthur Foundation, Completing the Picture: How the Circular Economy Tackles Climate Change, 2019, pp. 18–22.

⁶⁸ Morningstar Sustainalytics, ESG Funds Under ESMA Naming Rules: Market Impacts, 2024, pp. 3–5.

disclosures and/or unusual methodological approaches increase the verification burden and may be deemed unsuitable for inclusion in constrained ESG funds.

Market-enforced discipline is critical to the integrity of the thesis lens. Regulatory coercion is only one channel of legitimacy through which sustainability claims gain credibility; norms of investor behaviour, market expectations, and external review practices constitute other channels of discipline. ICMA is situated at the centre of these disciplinary channels by establishing a shared understanding that serves as an informal disciplinary mechanism. If an issuer departs from ICMA norms, whether in terms of providing insufficient methodological detail, inadequate explanations of sampling techniques, or unconventional KPIs, investors will demand additional documentation, reduce their orders, or exclude the instrument from sustainability-focused portfolios.

Additionally, ICMA's connection to the external-review community enhances its significance in the rule stack. Reviewers rely extensively on ICMA Guidelines when reviewing issuers' frameworks, allocating proceeds, and calculating impact. Reviewers use ICMA Guidelines as the standard of comparison for evaluating issuer practices. The EuGBS requires reviewers to register and be supervised by ESMA, but ICMA provides the methodological foundation for virtually all review processes (Sustainability Auditors Association, 2023)⁶⁹. Consequently, ICMA Guidelines indirectly determine the content, structure, and scope of external reviews and reinforce ICMA's central role in generating reliable evidence.

Another key function of the ICMA Guidelines is to facilitate the development of data structures and machine-readable formats. Although regulation increasingly promotes the creation of structured digital disclosures, ICMA is responsible for creating templates and formats that have been incorporated into analytical systems employed by data providers and buy-side firms. Many buy-side data platforms used for portfolio classification under ESMA's Sustainable Finance Disclosure Regulation (SFDR) rely on ICMA-defined fields. This compatibility between ICMA Templates and Investor Systems reduces friction in compliance and reporting associated with standardized data and facilitates the automated ingestion of data from issuer-provided machine-readable annexes (EFRAG, 2023).

⁶⁹ Sustainability Auditors Association, *External Review in Sustainable Debt Markets*, 2023, pp. 8–13.

Furthermore, the interrelationship between ICMA Guidelines and taxonomy-based regulation enhances data lineage, another fundamental aspect of the thesis integrity lens. Because ICMA encourages issuers to report underlying activity data, baseline assumptions, and methodological notes, the data used for EuGBS allocations and impact reporting can be traced downstream to EBA Pillar 3 templates, ESMA fund disclosures, and ultimately to corporate sustainability reports filed pursuant to the EU Corporate Sustainability Reporting Directive (CSRD) (European Financial Reporting Advisory Group, 2023). With more granular and consistent data, investors can correlate issuer-level documentation with portfolio constraints and supervisory templates. This enhances the "evidence chain" connecting bond-level disclosures to balance-sheet-level reporting, reduces verification gaps, and increases the credibility of the system.

ICMA Guidelines also support the thesis integrity lens by facilitating replication: the ability of independent third parties to reproduce the issuer's calculations. Replication is arguably the strongest mechanism for validating credibility in sustainable finance; however, it requires issuers to provide sufficient methodological detail, data inputs, and calculation logic. ICMA encourages issuers to provide this information through explicit recommendations for minimum disclosure standards for baselines, emissions factor selection, calculation transparency, and sensitivity analysis. Where issuers comply, replication becomes feasible; where issuers do not, impact claims remain unsubstantiated, and (Flammer, 2021)⁷⁰.

An emerging feature of ICMA's role in the rule stack is the increasing alignment of ICMA's frameworks with corporate sustainability reporting under CSRD/ESRS. As companies prepare to file digital ESRS-compliant sustainability reports, the data points and KPIs reported in impact reporting will likely converge with the broader corporate reporting ecosystem. ICMA's decision to align certain impact metrics with ESRS indicators accelerates this convergence and enables issuers to develop integrated reporting systems that support both corporate sustainability reporting and reporting on labelled debt, thus reducing duplication and promoting consistency.

Lastly, ICMA Guidelines promote the resilience of the sustainable debt market by enabling adaptability. Unlike regulations, which typically have lengthy update cycles, ICMA can update its Guidelines annually in response to changes in the market, technological advancements, and advances in our scientific understanding of environmental impacts. This ongoing capability ensures that

⁷⁰ Flammer, C., "Corporate Green Bonds", *Journal of Financial Economics*, 142(2), 2021, pp. 507–508.

methodological guidance is current, sophisticated, and reflective of best practices. It also ensures that the rule stack remains resilient as environmental, regulatory, and financial conditions evolve. The interplay of EuGBS (regulatory foundation) and ICMA (methodological might) creates a coherent system that can maintain integrity while adapting to changing conditions.

2.1.3 Reporting environmental impact without inflating it

The leading industry association provides the framework for issuers to develop credible impact claims. Yet the claims remain inconsequential until they are assessed against the demand-side constraints in the portfolio-construction process. As shown above, guidelines from the market standards body enable investors and external assessors to assess the integrity of the issuer's use-of-proceeds and impact calculations by providing comparable, traceable, and replicable disclosures at the instrument level. Nevertheless, the methodological integrity of an issuer's disclosures will not necessarily dictate how instruments are categorized, held, or defended within investment products. Rather, it is the European regulatory authority's guidelines that set the conditions for portfolio construction (European Securities and Markets Authority, 2024)⁷¹. Fund-naming rules (the supervisory authority's guidelines) serve as the market-facing enforcement layer of the European rule stack and therefore condition the eligibility and ongoing classification of portfolios based on measurable evidence. Therefore, subchapter 3.3 describes how the EU market watchdog's naming thresholds translate issuer-level documentation into binding portfolio constraints and transform the depth of evidence into a determinant of investability and provide the link between the structural characteristics of disclosures and capital allocation outcomes.

The evolution of the European rule stack has progressively raised expectations for labelled financial products. The supervisory authority's fund-naming guidelines are the demand-side mechanism through which sustainability claims are implemented at the portfolio level (European Securities and Markets Authority, 2024)⁷². The EuGBS enhanced the credibility of the issuer's use-of-proceeds at the instrument level, while the industry association's guidelines provided methodological disciplines to enhance consistency across issuer methodologies. On the other hand, the regulatory agency's naming discipline governs how the issuer's sustainability claims translate into fund-level constraints and determine investment eligibility.

The guidelines issued by the European oversight body are the first binding EU regulation to address the marketing integrity of sustainability-labelled funds. They establish measurable thresholds and

⁷¹ European Securities and Markets Authority. (2024). Guidelines on Funds' Names Using ESG or Sustainability-Related Terms. Paris: ESMA, pp. 2–3.

⁷² European Securities and Markets Authority. (2024). Guidelines on Funds' Names Using ESG or Sustainability-Related Terms. Paris: ESMA, pp. 7–9.

exclusion criteria and set expectations for ongoing monitoring. At the heart of these requirements is a simple but far-reaching rule: a fund referenced in its name as ESG or sustainability must show that at least 80 percent of its assets satisfy the sustainability characteristics indicated by the name of the fund and are subject to further exclusions that depend on the specific terminology used (European Security and Market Authority, 2024)⁷³.

Therefore, the 80 percent rule converts the largely narrative domain of investor communications related to ESG into a verifiable quantitative requirement. Prior to the implementation of the 80 percent rule, ESG terminology in fund names was based on discretionary internal classification schemes, varied screening methods, and different interpretations of what constitutes "ESG integration." Therefore, there existed a high degree of variability and vulnerability to accusations of greenwashing (European Court of Auditors, 2021)⁷⁴. The supervisory body's guidelines address this issue by establishing fixed definitional anchors that constrain arbitrary interpretations and require explicit documentation.

Fund-naming rules have an effect that goes beyond branding. Because fund names influence distribution channels, investor expectations, and portfolio classification systems, naming constraints directly affect asset demand. Under the European regulator's oversight, portfolio managers must ensure that the instruments in ESG-named funds are not only labelled as sustainable but also documented with structured evidence. This increases compliance costs for issuers that hold instruments with weak, unverified, or no standardized disclosures (Morningstar Sustainalytics, 2024)⁷⁵. Conversely, instruments that have fact sheets that are aligned with the EuGBS, industry-standard impact appendices, and machine-readable allocation data are operationally less difficult to justify and defend within ESG portfolios. Therefore, these guidelines create a demand-side incentive structure: strong documentation increases investability.

In addition to specifying the documentation requirements for ESG named funds, the regulatory agency's guidelines also specify exclusions that apply to ESG named funds based on the linguistic categories in their names. Funds that use terms such as "sustainable," "impact," or "transition" in their name must exclude investments that cause significant harm to environmental or social goals and typically would involve evaluating the use of SFDR's principal adverse impacts indicators and/or taxonomy-based considerations (European Commission, 2022)⁷⁶. These exclusions reinforce the need

⁷³ European Securities and Markets Authority. (2024). Guidelines on Funds' Names Using ESG or Sustainability-Related Terms. Paris: ESMA, paragraphs 14–18, pp. 8–10.

⁷⁴ European Court of Auditors. (2021). Sustainable Finance: EU Action Needs Better Targeting, Coordination and Monitoring. Luxembourg: ECA, pp. 18–20.

⁷⁵ Morningstar Sustainalytics. (2024). ESG Funds Under ESMA Naming Rules: Market Impacts. Amsterdam: Sustainalytics, pp. 4–6.

⁷⁶ European Commission. (2022). Commission Delegated Regulation (EU) 2022/1288 Supplementing Regulation (EU) 2019/2088. Brussels: European Commission, Annex I, pp. 33–41.

for reliable issuer-level evidence. Portfolio managers must determine whether the issuer is violating any of the exclusion criteria, which is feasible only when documentation exists for the entire rule stack. Therefore, issuers that do not document their activities in accordance with recognized standards impose higher verification costs and are more likely to be excluded.

When assessing the implications of these guidelines for issuers, it is helpful to examine the common portfolio workflow practices. The requirements call for both pre-trade and ongoing compliance. Therefore, portfolio managers must classify the instruments they intend to purchase and periodically reassess those classifications. A consistent classification requires that evidence-ready disclosures exist for the instruments; particularly, machine-readable appendices, taxonomy alignment tables, NACE level activity mappings, and reviewer conclusions. Instruments that lack the required documentation create operational friction and may be downgraded or removed during periodic reviews. For banks subject to Pillar 3 reporting, this creates a reinforcing loop: data supporting GAR and BTAR can also support fund-level classification, thereby increasing the value of internal alignment (European Banking Authority , 2022)⁷⁷.

Therefore, these guidelines have two important effects on market behaviour. Firstly, the requirements reduce the attractiveness of sustainability claims that lack hard evidence and shrink the market for instruments that rely on narrative rather than demonstrable impact. Secondly, the standards reward issuers whose disclosures anticipate the requirements of portfolio workflow and provide the documentation necessary for low-friction inclusion in ESG funds. Data from early implementations suggest that funds have increasingly favoured issuances with better-structured disclosure, particularly those aligned with the EuGBS and industry guidelines, because they reduce the probability of breaching the naming threshold during audit cycles (Amundi Asset Management , 2024)⁷⁸.

The regulatory authority's guidelines also affect the economics of sustainable debt. Since a large percentage of European asset management is represented by portfolios constrained by ESG terminology, the ability of an instrument to qualify for these funds affects its demand profile, order-book depth, and pricing dynamics. Instruments that include high-quality evidence packages, strong assurance, and taxonomy-aligned use-of-proceeds have been associated with more stable allocations within ESG funds and lower turnovers due to reclassification risk. On the other hand, issuers that disclose insufficiently comparable, machine-readable, or externally reviewed information face a higher risk of exclusion and therefore experience lower investor reach and wider spreads relative to comparable bonds supported by stronger evidence (Flammer, 2021)⁷⁹.

⁷⁷ European Banking Authority. (2022). *Implementing Technical Standards on ESG Risk Disclosures under Pillar 3*. Paris: EBA, pp. 10–12.

⁷⁸ Amundi Asset Management. (2024). *ESG Fixed Income Market Review 2024*. Paris: Amundi, pp. 22–24.

⁷⁹ Flammer, C. (2021). 'Corporate Green Bonds'. *Journal of Financial Economics*, 142(2), pp. 499–516.

Finally, the market regulator's naming guidelines enhance cohesion within the European rule stack. While the EuGBS establishes the standards for issuance, and the industry association provides the methodological disciplines to increase the coherence of methodology, the supervisory body enforces accountability at the point where instruments are evaluated in conjunction with the actual flow of investments. The result is a system in which sustainability claims developed by issuers must be robust enough to withstand scrutiny by regulators at both the instrument and portfolio levels. Portfolio alignment serves as a test of the credibility of issuers' sustainability claims and ensures that weak claims do not proliferate into the investment stream. Therefore, these guidelines complete the rule stack by converting the quality of documentation into tangible market consequences (OECD, 2023)⁸⁰.

2.1.4 Portfolio labels and the discipline of asset allocation

One of the most important ways in which the European Rule Stack creates a discipline of evidence is at the Prudential Layer – the layer at which sustainability claims created at the point of issuance and at the time of portfolio creation eventually need to merge into supervisory grade disclosures. This process is conducted through the EBA's ESG Pillar 3 Package, released in 2022 and gradually implemented from 2023 onward. The package contains legally enforceable Implementing Technical Standards (ITS), quantitative templates, and qualitative tables, compelling banks to disclose climate and environment-related information in a standardized way. While the ESG Pillar 3 differs from previous sustainability reporting initiatives in terms of its legal obligations and architecture, the key difference is that the package includes legally defined categories, obligatory templates, quantitatively comparable data across banks, and alignment with the broader EU Taxonomy Framework. Therefore, ESG Pillar 3 is the anchor of the evidence chain, transforming the narrative of green bond claims, ICMA-aligned methodologies, and ESMA-driven portfolio classifications into facts on a bank's balance sheet (European Banking Authority, 2022)⁸¹.

The central quantitative elements of the EBA's Pillar 3 ESG package are two Key Performance Indicators (KPIs): the Green Asset Ratio and the Banking Book Taxonomy Alignment Ratio. The Green Asset Ratio (or taxonomy-aligned asset ratio) measures the percentage of non-financial corporate and mortgage exposures classified as compliant with the EU Taxonomy under Article 8 of the regulation (European Commission, 2020)⁸². This metric is intentionally strict: exposures are only considered aligned if they meet all Technical Screening Criteria, the "Do No Significant Harm" requirements, and minimum social safeguards. As a result, there is considerable variation in reported

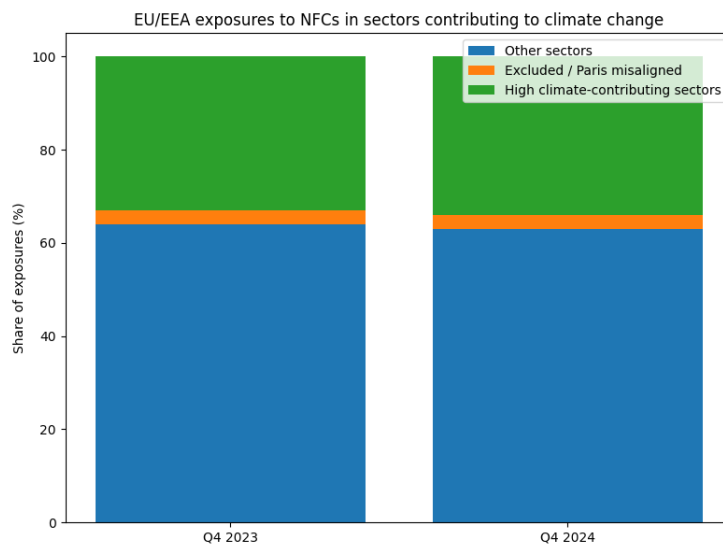
⁸⁰ OECD. (2023). *Driving Market Integrity in ESG Investing*. Paris: OECD Publishing, pp. 25–28.

⁸¹ European Banking Authority (2022). *Implementing Technical Standards on ESG Pillar 3 disclosures*. Paris: EBA.

⁸² European Commission (2020). *Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment*. Brussels: European Commission.

values across European banks. According to the EBA's 2024 Risk Dashboard, significant institutions reported averages of 7–9% in 2023 (European Banking Authority, 2024)⁸³. Fig. 1.1 (European Banking Authority, 2025)⁸⁴ represents the development of EU/EEA bank's total exposures to corporate bodies with a high contribution to climate change and shows that there is no significant difference between Q4 2023 and Q4 2024, which further confirms that transition-risk concentration has remained structurally persistent in the European banking system.

Figure 1.1 EU/EEA Bank Exposures to Non-Financial Corporations (NFCs) in Climate-Relevant Sectors, 2023–2024⁸⁵



Retail banks typically show lower ratios, while specialized lenders with large portfolios of renewable energy or energy-efficient property tend to report higher ones. This variability reflects differences in business models and sector focus; precisely the kind of variation standardized templates aim to clarify.

However, the Green Asset Ratio only reflects the "current hard alignment" of a bank's portfolio to the Taxonomy. To capture the forward-looking nature of transition finance, the EBA introduced the Banking Book Taxonomy Alignment Ratio, which measures the portion of a bank's exposures that are not yet fully aligned but are on track to become compliant, for example, through planned capital expenditures or published transition plans. These two metrics are designed to be read together: one showing the present state, the other indicating future potential for alignment. This dual approach

⁸³ European Banking Authority (2024). Risk Dashboard Q2 2024. Paris: EBA.

⁸⁴ The Graph represent aggregated EU/EEA exposure data from the EBA ESG Dashboard (Transition Risk – NFCs), in depth the "All Countries" bars for Q4 2023 and Q4 2024, that report 33–34% exposure to high climate-contributing sectors, 3% Paris-misaligned exposures, and 63–64% exposures to other sectors.

⁸⁵ European Banking Authority (2024). Risk Dashboard Q2 2024. Paris: EBA.

improves comparability across banks and highlights the distinction between those with currently low taxonomy-compliant exposure and those actively shifting their portfolios. In 2024, several European banks reported future-alignment ratios two to three times higher than their current taxonomy-aligned figures, emphasizing the importance of measuring transition progress.

In addition to GAR and BTAR, Pillar 3 includes detailed risk management templates that are aligned with the ECB's 2020 Guide on Climate-Related and Environmental Risks. Under Pillar 3, banks are required to provide the following: governance structures and board oversight; risk taxonomy definitions; scenario analysis methodologies; exposure breakdowns by physical and transition risk drivers; and quantitative climate risk metrics. With the ECB's shift from "comply or explain" to enforcement, the implications of providing inaccurate or incomplete disclosures have increased substantially. In 2024, the ECB indicated that banks that failed to integrate climate risks into their supervisory assessments would face penalties (European Central Bank, 2024)⁸⁶. Several banks received formal notices from the ECB. Therefore, the ECB's enforcement posture enhances the credibility of the Pillar 3 templates: when banks face penalties for discrepancies between the amount of risk exposures reported and the actual amount of risk exposures experienced, the incentives for banks to provide accurate, consistent disclosures increase dramatically.

A unique aspect of Pillar 3 and its contribution to comparability is the requirement that templates be provided in a machine-readable format, i.e., XLSX or CSV. The machine-readability of the templates enables automated ingestion into investor systems, supervisory dashboards, and data provider platforms. This is a key characteristic of Pillar 3, as it aligns with the ESMA's initiative to make fund disclosure annexes machine-readable (European Securities and Markets Authority, 2023)⁸⁷ and with EFRAG's efforts to develop XBRL tagging under the Corporate Sustainability Reporting Directive (CSRD) (European Financial Reporting Advisory Group, 2023)⁸⁸. The overall result is a multi-regulatory system in which EuGBS allocation tables, ICMA impact annexes, ESMA fund naming classification files, and EBA prudential templates contain similar identifiers (particularly NACE codes and Taxonomy activity codes). This facilitates interoperability across the various regulatory bodies involved in sustainability finance; it decreases the verification costs for investors who wish to verify the taxonomy mapping of green bonds: once a bank has declared that a green bond finances Taxonomy Activity 4.1 (Solar Photovoltaic) or 7.1 (Energy Efficient Building Construction), the

⁸⁶ European Central Bank (2024). Supervisory priorities and climate-risk enforcement. Frankfurt: ECB.

⁸⁷ European Securities and Markets Authority (2023). Guidelines on Machine-Readable Disclosures. Paris: ESMA.

⁸⁸ EFRAG (2023). Draft ESRS XBRL Taxonomy. Brussels: European Financial Reporting Advisory Group.

same activity code will appear in the Pillar 3 templates, unchanged. The evidence will travel consistently throughout the regulatory stack.

Comparability of Pillar 3 disclosures is further enhanced by the quality and detail of its guidance. The ITS provides clear and specific boundaries for the templates; for example, which exposures are in scope, how to distinguish between secured and unsecured lending, how to treat revolving credit, which derivatives must be included, and how to handle missing data. Importantly, the ITS instructs banks to apply conservative assumptions when data is unavailable, preventing them from artificially increasing the number of Taxonomy-compliant exposures by using overly optimistic proxies. This ensures that data comparability is maximized and minimizes the potential for methodological gamesmanship.

Additionally, Pillar 3 operates within an internationally coordinated regulatory environment facilitated by the Basel Committee on Banking Supervision (BCBS). On June 25, 2025, the BCBS finalized a voluntary climate disclosure framework for globally active banks (Basel Committee on Banking Supervision, 2025)⁸⁹, establishing baseline qualitative and quantitative disclosure expectations for global banks. While the BCBS framework is less prescriptive than the EU's regulatory framework and does not require KPIs equivalent to GAR or BTAR, it provides a minimum level of comparability across jurisdictions. For multinational investors, the EU's Pillar 3 templates provide depth, while the BCBS framework provides breadth. Therefore, European banks benefit from being simultaneously compatible with a global baseline and subject to a more stringent EU regulatory regime.

Empirical evidence is increasingly indicating that strong Pillar 3 alignment affects market outcomes. S&P Global Ratings (2023) found that green bonds issued by banks with stronger Taxonomy and Pillar 3 reporting had larger ESG-oriented order books and tighter pricing (by 1–3 basis points) compared to conventional comparables (S&P Global Ratings, 2023)⁹⁰. Market participants indicate that reconciling EuGBS allocation reports with Pillar 3 GAR/BTAR numerators simplifies portfolio classification under ESMA's fund-naming rules. Conversely, banks with opaque or inconsistent methodologies experience the opposite: investor downgrades, exclusion from ESG funds, and decreased secondary-market liquidity.

Notwithstanding the above, comparability challenges still exist. GAR accounts for only a portion of

⁸⁹ Basel Committee on Banking Supervision (2025). Climate-related financial disclosure framework. Basel: Bank for International Settlements.

⁹⁰ S&P Global Ratings (2023). Green Bonds: Pricing, Disclosure and Market Behaviour. New York: S&P Global

the bank's balance sheet (i.e., it excludes sovereign exposures, trading-book positions, and a substantial portion of SME lending). BTAR relies heavily on the extent of corporate disclosure of Taxonomy-compliant CapEx plans; where corporations fail to disclose such plans, BTAR values may underestimate the transition potential of the bank's portfolio. Additionally, the degree of comparability between banks and outside the EU is limited. While the BCBS provides a minimum baseline, it lacks the Taxonomy backbone that anchors EU disclosures.

Despite the limitations outlined above, Pillar 3 fulfils a structural function in the rule stack. It converts issuer-level sustainability claims, initially filtered through EuGBS templates, ICMA methodologies, and then subject to ESMA portfolio thresholds into prudential evidence. The architecture of Pillar 3 requires alignment: banks cannot use Taxonomy mapping in their green bond frameworks unless they replicate it in their Pillar 3 disclosures. Similarly, investors cannot justify ESG fund investments based on the underlying issuers' Pillar 3 compatible data.

Ultimately, comparability in European sustainable finance is no longer a "nice-to-have "; it is engineered. Through rigid templates, machine-readable structures, enforcement mechanisms, and taxonomy-anchored KPIs, Pillar 3 transforms sustainability from a narrative to an evaluative supervisory dataset. The credibility of the European market now rests on its ability to ensure that what is represented in prospectuses and frameworks is what appears, in numbers, on the bank's balance sheet.

2.2 Designing Frameworks That Survive Scrutiny

The previous chapter illustrated how the European Rule Stack; especially the EuGBS, the ICMA reporting canon, ESMA's fund-naming regime, and the EBA's Pillar 3 ESG templates that builds a multi-layered structure that requires all sustainability claims to eventually meet the standards of supervisory-grade evidence. This chapter follows up on that foundation by demonstrating that integrity is not a product of the end-result of sustainability efforts, but an embedded design principle that exists throughout each stage of the sustainable finance process. Integrity is built in through the matching of frameworks, investment practices, and impact verification so that information flows consistently from the point an issuer develops a green strategy to the point those claims become auditable numbers appearing in a bank's prudential disclosures.

At the issuance level, integrity starts with the quality of the design of the sustainability frameworks used. The European Green Bond Standard creates ex-ante credibility by requiring issuers to show Taxonomy compliance, undergo external verification via accreditation, and make available allocation

methodology in machine readable format. ICMA's 2023 updates to the Green Bond Principles reinforce this development by requiring issuers to articulate their impact modeling assumptions and quantification methods. According to ICMA's 2024 assessment of the global labeled market, 89% of European issuers now present detailed methodologies for assessing impact, up from 62% in 2020 (International Capital Market Association (ICMA), 2024)⁹¹. A large jump in the number of European issuers presenting detailed methodologies for assessing impact reflects both regulatory pressure and investor expectations. The ECB has also stated the importance of high-quality frameworks: issuances without external verification have methodological discrepancies in 58% of cases versus only 12% among EuGBS aligned bonds (European Central Bank, 2024)⁹². Data like this makes clear that, while providing evidence of integrity at the time of issuance is a formal obligation, integrity is a functionally determining factor of how credible the instrument will be during the rest of its life cycle.

Allocation integrity refers to the extent to which the use of proceeds by an issuer aligns with the sustainability representations made at the time of issuance. As it relates to the allocation of proceeds to support sustainability projects, European green bond markets surpass other major jurisdictions. Climate Bonds Initiative's 2024 market report states that approximately 78% of proceeds from European green bond issuances are directed toward Taxonomy eligible sectors, versus approximately 49% in the U.S., and 37% in China (Climate Bonds Initiative, 2024)⁹³. Allocation integrity is only fully realized when it is measurable against prudential data. That is when the Pillar 3 data previously described in this report becomes critical. The EBA's transition-risk indicators show that about a third of EU/EEA bank exposures to non-financial corporate entities lie in sectors that contribute heavily to climate change, while only slightly above 3% relate to Paris misaligned companies (European Banking Authority, 2024)⁹⁴. These proportions impose natural limits on the credibility of allocations based on sustainability: banks may issue green bonds funding high quality, Taxonomy compliant assets, however, their total legacy portfolio may still be inherently carbon intensive. UniCredit provides a specific illustration of this challenge. Although UniCredit issued approximately €7.85 billion in green and sustainable bonds between 2021 and 2024, the bank's Pillar 3 GAR for 2024 was approximately 8.4% (UniCredit S.p.A., 2024)⁹⁵. The gap between the two does not represent bad faith on the part of UniCredit. Rather, the gap illustrates the inherent difficulties of aligning legacy portfolios with strict Taxonomy-based screening criteria. This is precisely why allocation integrity

⁹¹ Data from the International Capital Market Association (ICMA), Impact Reporting Handbook Review 2024, p. 14.

⁹² European Central Bank (ECB), Supervision Newsletter – External Review Quality Assessment, p. 6.

⁹³ Climate Bonds Initiative (CBI), Green Bond Market Report 2024, p. 22.

⁹⁴ European Banking Authority (EBA), ESG Dashboard – Transition Risk Indicators (Q4 2024), dataset table “NFC Sector Exposure”, no page number (dashboard dataset).

⁹⁵ UniCredit S.p.A., Pillar 3 Disclosure Report – ESG Annex 2024, p. 37.

should be reinforced by prudential evidence gathered by supervisors to capture the entire scope of a portfolio.

It is here where the expectations of impact integrity are the greatest, and where variability is most pronounced. Variability in impact reporting across issuers can be extreme. ICMA's 2024 impact reporting survey found differences in estimated avoided emissions for comparable renewable energy assets ranging from one to seven times, primarily due to methodological discretion (International Capital Market Association, 2024)⁹⁶. Both the EuGBS and the Pillar 3 framework seek to mitigate such variability by establishing standardization in activity-level reporting, NACE-code mapping, and machine-readable output, thus permitting automated cross checking across regulatory levels. The importance of supervisory anchoring is evident in the ECB's physical-risk disclosures. Median exposures to areas vulnerable to physical climate-related risk amounts to approximately 22% in Northern and Western Europe, 43% in Central and Eastern Europe, and 25% in Southern Europe, with significant outlier exposures exceeding 80% in some jurisdictions (European Central Bank, 2024)⁹⁷. These figures illustrate that impact assessments cannot rely solely on the choice of metrics selected by issuers but must be assessed considering the actual risk conditions and reported within a regulated prudential framework.

The relationship between current alignment and forward-looking commitments further illustrates the complexity of impact integrity. The average GAR values of EU significant institutions in 2024 range from 7% to 9%, indicating strict adherence to Taxonomy requirements. However, BTAR values are usually two to three times greater (European Banking Authority, 2024)⁹⁸, illustrating the potential for significant future alignment through planned CapEx. This disparity supports the argument that integrity of impact means both the "now", the rigor of Taxonomy compliant activities, and the "later", the credibility of transition trajectories supported by verifiable CapEx and transition plans.

Ultimately, integrity emerges from the system rather than from individual components. The European Rule Stack connects the dots between frameworks, allocation, and impact by creating evidence that can flow between layers of regulation. Frameworks determine what is considered sustainable; allocation reporting record what is being financed; and impact verification: using prudential data and risk indicators which assesses whether the activities undertaken have a material effect on environmental outcomes or risk exposures. ESMA's 2024 enforcement of fund naming rules demonstrates how this systems-level approach to designing regulations shapes market behaviour. Funds unable to document the required 80% threshold for environmental or social characteristics

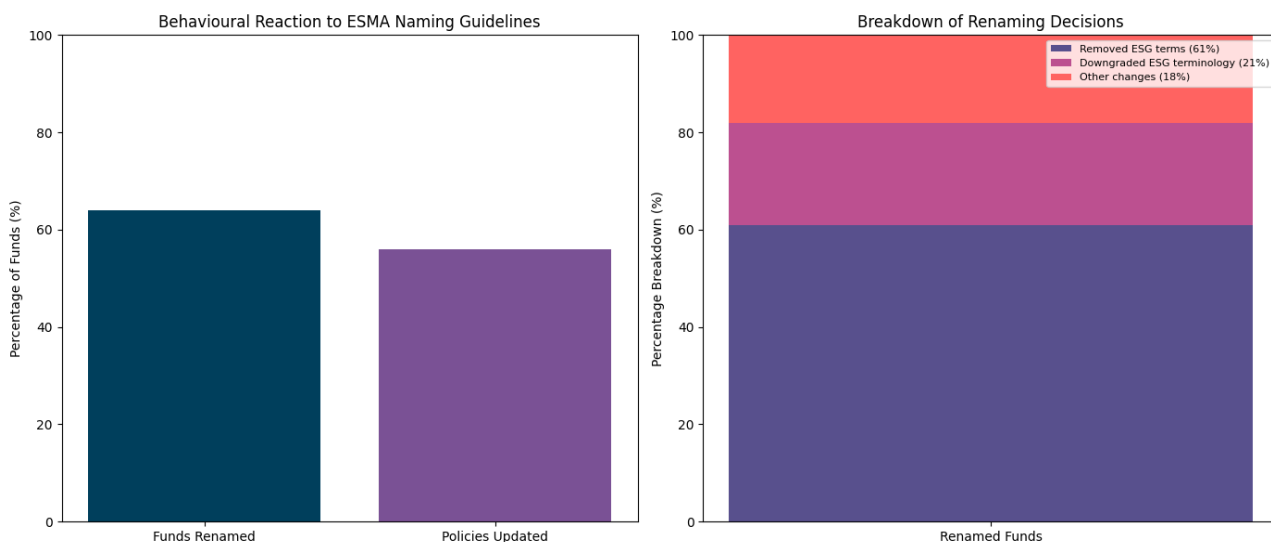
⁹⁶ ICMA, Impact Reporting Survey 2024, p. 11.

⁹⁷ ECB, Climate-related Risk and Vulnerability Assessment 2024, p. 18.

⁹⁸ EBA, ESG Risk Disclosure Statistics (GAR/BTAR Summary 2024), dataset table "Taxonomy KPIs".

were required to remove ESG terminology from their names, leading to a 21% decline in ESG-labelled Article 8 funds (European Securities and Markets Authority, 2024)⁹⁹. ESMA's supervisory review provides a substantial amount of evidence that enforcement driven behaviour is being influenced by the regulatory environment. Nearly 1000 ESG funds were reviewed to determine how many (64%) had changed names and how many (56%) had revised investment policies, in addition to 61% having removed all references to ESG from their investment policies. The data provided is consistent with the fact that regulatory integrity requirements are reshaping claims throughout the entire value chain¹⁰⁰

Figure 1.2 Behavioural Impact of ESMA’s 2023 Naming Guidelines on EU Funds: Renaming Rates and Breakdown of Terminology Adjustments¹⁰¹



This demonstrates the ability of an integrated regulatory architecture to shape incentives and create better market discipline.

Integrity creates tangible financial value. S&P Global's 2023 analysis demonstrated that European green bonds issued by banks that had strong GAR transparency and alignment for their issuances priced one to three basis points lower than comparable issuances by their peers with less transparent disclosure (S&P Global Ratings, 2023)¹⁰². In a market increasingly characterized by demonstrable

⁹⁹ European Securities and Markets Authority (ESMA), Final Report – Guidelines on Funds’ Names Using ESG or Sustainability-related Terms (2024), p. 27.

¹⁰⁰ European Securities and Markets Authority (ESMA), TRV Article: Impact of the ESMA Guidelines on the Use of ESG or Sustainability-Related Terms in Fund Names (ESMA50-801628861-4423), 17 December 2025; ESMA, ESMA Reviews Impact of Guidelines on ESG or Sustainability-Related Terms in Fund Names, Press Release, 17 December 2025.

¹⁰¹ European Securities and Markets Authority (2023) ESMA Final Report – Guidelines on Funds’ Names Using ESG or Sustainability-Related Terms, ESMA34-472-440, 14 November, pp. 18–21.

¹⁰² S&P Global Ratings, European Financial Institutions Green Bond Pricing Study 2023, p. 9.

environmental performance, credibility becomes a valuable competitive asset. Designing integrity into the process of sustainable finance converts sustainability from a branding exercise to a measurable and risk adjusted contributor to financial performance.

2.2.1 The Anatomy of a Credible Green Bond Framework

As we previously discussed, the European Rule Stack constrains sustainability claims toward the level of evidence required by supervisory bodies. Therefore, the purpose of the green bond framework is to serve as the "source code" of credibility, i.e., if the framework is poorly developed, then the subsequent discipline that will be applied by EuGBS, ESMA and Pillar 3 may be able to correct it somewhat, whereas a strong framework allows the above mentioned levels to multiply its credibility and convert it into decision-useful data.

Given the size of the global market, frameworks constitute a systemically important infrastructural component. As of today, cumulative global issuance of green bonds aligned with the green economy has reached \$3.4 trillion, representing (Climate Bonds Initiative, 2024)¹⁰³ debt outstanding globally. Additionally, annual global issuance of green bonds in 2024 alone reached \$500 billion, an increase of 14% compared to the prior year (Climate Bond Initiative, 2024)¹⁰⁴, despite more restrictive monetary policies. Similarly, within the European Union, the proportion of green bonds among total bonds issued has grown from less than 1% in 2014 to approximately 7% in 2024 (European Commission, 2024)¹⁰⁵, accounting for nearly 7% of all bonds issued during that time frame. The growth of the green bond market demonstrates that while there is little debate about whether green bonds are significant, whether the frameworks governing them will continue to keep pace with the increasing volume of green bonds remains open to question.

In this regard, the European Union's Green Bond Regulation transforms what was once voluntary best practices into a statutory definition of requirements for green bonds. The EU Green Bond Regulation provides a minimum threshold of 85% of green bond proceeds (European Parliament and Council, Brussels)¹⁰⁶ to be allocated to activities that are aligned with the EU Taxonomy. The regulation also formally defines the allocation and reporting requirements for proceeds to green bond recipients and

¹⁰³ Climate Bonds Initiative (2024) Sustainable Debt: Global State of the Market 2023. London: Climate Bonds Initiative, pp. 12–13.

¹⁰⁴ Climate Bonds Initiative (2024) Annual Market Update 2024. London: Climate Bonds Initiative, p. 7.

¹⁰⁵ European Commission (2024) EU Sustainable Finance Framework Progress Report. Brussels: European Commission, p. 22.

¹⁰⁶ European Parliament and Council (2023) Regulation (EU) 2023/2631 – European Green Bonds. Brussels: Official Journal of the EU, p. 18.

subjects' external reviewers to ESMA registration and supervision. The early adopter trend of the EU Green Bond Regulation is illustrative of the demands placed upon the green bond issuer by the regulation, as evidenced by the fact that fewer than a handful of issuers, such as Île-de-France Mobilités, A2A and ABN AMRO (European Securities and Markets Authority, 2024)¹⁰⁷, elected to apply for the EU Green Bond (EuGB) label in the initial few months since the regulations went into effect. The difference between the total amount of green bonds issued and the amount of green bonds that were issued under the EU Green Bond Regulation reflects the degree of difficulty presented by the regulation in terms of aligning the proceeds with the EU Taxonomy, ensuring transparency of the allocation of proceeds, and providing auditable evidence of the impacts resulting from the green bond.

However, a robust framework is not solely focused on compliance with a set of rules and guidelines; it is ultimately about establishing the likelihood that future Pillar 3 data will exist and be applicable. Today, many leading European issuers regularly publish frameworks that identify each eligible project category and link it to specific EU Taxonomy activities and NACE codes (International Capital Market Association, 2023)¹⁰⁸. Further, most issuers include quantitative thresholds for eligibility (e.g., a maximum gCO₂/kWh for electricity generation or a minimum performance improvement for renovation projects). Many issuers adopt "look-through" approaches for complex structures, such as securitizations or project finance. Governance is becoming increasingly detailed: e.g., in many cases, utilities disclose that project selection is overseen by a sustainability committee that includes risk management and internal audit, not merely treasury. More issuers are committing to tagging projects in their internal systems, a prerequisite for GAR and BTAR reporting (European Banking Authority, 2023)¹⁰⁹.

Studies of euro-denominated green bonds show that issuers that develop credible frameworks, undergo independent verification, and provide high-quality environmental performance receive substantially greater investor premiums than other issuers. Specifically, studies show that when comparing the yields of green bonds to similar conventional bonds, the average greenium, a lower yield for green bonds, ranges from 10 to 20 basis points (Zerbib, 2019)¹¹⁰. Moreover, the studies show that it is significantly larger for bonds that combine a credible framework, independent verification, and high-quality environmental performance of the issuer. For certified or EuGB-aligned bonds, the

¹⁰⁷ European Securities and Markets Authority (2024) EuGB Registration and Market Monitoring Bulletin. Paris: ESMA, pp. 4–5.

¹⁰⁸ ICMA (2023) Green Bond Principles – 2023 Update. Zurich: ICMA, p. 28.

¹⁰⁹ European Banking Authority (2023) ESG Pillar 3 Technical Standards Final Report. Paris: EBA, pp. 45–47.

¹¹⁰ Zerbib, O.D. (2019) 'The effect of pro-environmental preferences on bond prices', *Journal of Banking & Finance*, 98, pp. 39–60.

estimated greenium can reach 25 basis points (Flammer, 2021)¹¹¹ under normal market conditions and increase even further during times of heightened climate-related stress. Thus, the price evidence clearly shows that developing robust frameworks reduces issuers' costs of capital and creates a clear financial incentive for issuers to "build integrity into design."

Investor expectations regarding disclosure are reinforcing the pressure on issuers to develop credible frameworks. Surveys of issuers and investors conducted globally reveal that virtually all large European green bond issuers now publish (ICMA, 2023)¹¹² at least one post-issuance allocation report, and a substantial majority publish allocation reports combined with impact reports at least annually. A recent survey of emerging-market sovereign issuers found that nearly 90 percent (World Bank, 2023)¹¹³ are currently meeting ICMA's core reporting principles by publishing at least one allocation or impact report over the life of a bond. Corporations and banks based in Europe and operating in a significantly more rigorous regulatory environment tend to be more advanced than this baseline, particularly where their securities are eligible for central bank purchase programs or where investors have formal net-zero mandates.

One area where the development of frameworks translates into system-wide expectations is the portfolio of the European Central Bank's (ECB) own funds, where the percentage of green bonds held by the ECB has increased from approximately 20% of total holdings in 2023 to around 28% in 2024, representing more than €6 billion of funding (Central Bank, 2024)¹¹⁴. Purchases of eligible securities depend upon the availability and quality of use-of-proceeds and impact information. Consequently, issuers who cannot demonstrate robust frameworks and transparent reporting may be excluding themselves from an important source of demand.

From the perspective of this thesis, therefore, robust frameworks for green bonds are not a superficial overlay, but rather the first gate in a pipeline of evidence. Frameworks establish whether later supervisory data: EuGBS allocation tables, ICMA impact annexes, ESMA fund name documentation, and EBA Pillar 3 templates, can be reconciled into a coherent picture of what a bond has financed (OECD, 2022)¹¹⁵. Frameworks that are poorly constructed create structural gaps in the ability to

¹¹¹ Flammer, C. (2021) 'Green bonds: Effectiveness and implications for public policy', *Journal of Economic Perspectives*, 35(3), pp. 10–12.

¹¹² ICMA (2023) *Global Impact Reporting Survey 2023*. Zurich: ICMA, pp. 6–7.

¹¹³ World Bank (2023) *Emerging Market Sovereign Green Bonds Review 2023*. Washington DC: World Bank, p. 14.

¹¹⁴ European Central Bank (2024) *ECB Climate-related Financial Disclosures 2024*. Frankfurt: ECB, pp. 32–33.

¹¹⁵ OECD (2022) *Financing Climate Action: Integrity and Verification in Sustainable Debt Markets*. Paris: OECD, p. 29.

reconcile supervisory data, regardless of how much ex-post GAR or BTAR reporting occurs; conversely, well-constructed frameworks enable a project identifier or NACE code to travel seamlessly from the documentation related to the issuance of a bond through to the issuer's internal systems and into disclosure templates.

2.2.2 Allocation reporting and the risk of overstatement

Allocation reporting describes "Where Did the Money Go?", and impact reporting describes "What Difference Did It Make?" Both types of reporting together demonstrate whether integrity is embedded in the bond's life cycle or is simply a theoretical idea.

As far as allocation is concerned, the global labelled debt market has reached cumulative issuance of more than \$5 trillion for green, social, sustainable, and sustainability-linked bonds, with green bonds accounting for approximately 60-65% of that figure (Climate Bonds Initiative, 2024)¹¹⁶. Within that universe of green bonds, European issuers have accounted for most of the aligned green volume issued by region, and in some recent periods, nearly 40-45% of all new aligned green issuance has originated in Europe (Climate Bonds Initiative, 2024)¹¹⁷. As such, the allocation practices of European issuers have exerted a disproportionate influence on what is deemed "standard" in the market.

Practices post-issuance have developed certain common characteristics. Most large European banks and corporations now publish allocation reports 12-18 months after issuing a green bond and then update them annually until the entire allocation is made (ICMA, 2023)¹¹⁸. The typical format for these allocation reports breaks down the total amount of the green bond that was allocated to specific project categories (renewable energy, green buildings, clean transportation, water and waste, etc.). An increasing number of issuers are providing more detailed metrics regarding the specifics of each project, including installed renewable energy capacity (MW), square footage certified to a particular building standard, and kilometres of low-carbon transportation infrastructure financed (ICMA, 2022)¹¹⁹. When issuers issue multiple currency programs, they typically also provide reconciliations of the program-level allocation to individual deal allocations to prevent double-counting.

¹¹⁶ Climate Bonds Initiative (2024) Sustainable Debt: Global State of the Market 2023. London: Climate Bonds Initiative, pp. 8–9.

¹¹⁷ Climate Bonds Initiative (2024) European Green Finance Report 2024. London: Climate Bonds Initiative, p. 11.

¹¹⁸ ICMA (2023) Annual Sustainable Finance Market Practices Review. Zurich: ICMA, pp. 16–17.

¹¹⁹ ICMA (2022) Harmonised Framework for Impact Reporting. Zurich: ICMA, pp. 23–26.

While the integrity of allocation reporting becomes increasingly complicated when comparing the allocation reporting against the underlying balance sheet, data collected by European banking regulators demonstrates that roughly one third of EU/EEA banks' exposure to non-financial corporate customers exist in sectors which have a significant contribution to climate change, and that slightly over 3% of their exposures (European Banking Authority, 2024)¹²⁰ exist to companies which are identified as being in conflict with the climate benchmarks aligned with the Paris Agreement. This type of composition creates a structural limitation for banks: even if a bank fully allocates numerous green bonds to Taxonomy-aligned projects, its existing portfolio will likely be much more carbon-intensive. In other words, while a bank may be able to develop high-quality allocation reporting, this does not necessarily mean that the bank's overall portfolio is sustainable; allocation reporting is essential but insufficient to determine the sustainability of a bank's portfolio.

Examples of specific issuers help illustrate this challenge. Many large universal banks have issued billions of euros in green and sustainable bonds over the 2021-2024 period and have used these funds to support a variety of projects, including renewable energy, energy-efficient mortgages, and clean transportation. However, their reported Green Asset Ratios (GAR) during this period have remained in the single-digit ranges and have averaged 7%, 9% for many of the significant banks - primarily due to the strict Taxonomy criteria and the fact that the sovereign exposures, trading books, and a substantial amount of SME lending are not included in the GAR numerator. While the gap between the "green funding flows" and the "green stock of assets" is not indicative of manipulation, it does demonstrate the difficulty of pivoting a large legacy balance sheet under a stringent, activity-based standard.

Impact reporting increases the potential for integrity, both in its positive and negative aspects. From a conceptual perspective, KPIs related to impacts such as tCO₂e avoided, MWh of renewable energy produced, m³ of water treated, or the number of households connected to clean transportation are logical proxies for measuring environmental impacts. In practice, the discretionary nature of the methodologies used to calculate impacts can yield a broad range of results. For example, studies of impact reports found differences of up to a factor of 7 (Puddu, 2022)¹²¹ in estimated avoided emissions for similar renewable projects resulting from varying baselines, grid emission factors, and project lifetime assumptions. In some cases, a given portfolio may be reported to deliver vastly

¹²⁰ European Banking Authority (2024) EBA ESG Risks and Vulnerabilities Report 2024. Paris: EBA, pp. 31–33.

¹²¹ Puddu, L. (2022) 'Do green bonds deliver? Impact reporting comparisons', *Journal of Sustainable Finance & Investment*, 12(4), pp. 455–478.

different climate benefits depending on the methodology used by the issuer - either conservatively or optimistically.

Regulatory initiatives have attempted to reduce the variability in impact methodologies. The EuGB framework provides issuers the opportunity to utilize sector-specific impact metrics and includes reference to common methodological guidelines; many European issuers have stated that they use ICMA or multilateral development bank-harmonized frameworks for renewable energy, energy efficiency, and clean transportation (ICMA, 2023)¹²². Additionally, the EBA's ESG Pillar 3 templates and the EBA ESG Dashboard require banks to disclose, in a standardized manner (European Banking Authority, 2022)¹²³, their exposures to sectors with a significant contribution to climate change, the proportion of their residential mortgage portfolios that are categorized in various levels of energy efficiency, and the proportion of their exposures to physical risks associated with climate change by region and maturity. These standardized disclosure requirements provide an independent verification of the reasonableness of issuer-provided impact numbers.

For example, Pillar 3 data show that for the EU/EEA banking system as a whole, approximately 63-64% of exposures to non-financial corporate customers are to entities in sectors other than those with a significant contribution to climate change, approximately 34% of their exposures are to entities in sectors with a significant contribution to climate change, and a small residual share of their exposures are to entities which are excluded from the climate benchmarks aligned with the Paris Agreement. Similarly, the aggregate disclosed data show that a significant portion of outstanding residential mortgage exposures continues (European Central Bank, 2024)¹²⁴ to be classified in lower-efficiency energy buckets or lack available energy performance data, exceeding 60% in some jurisdictions (European Banking Authority, 2024)¹²⁵. Finally, physical risk indicators show that median exposure to high-risk geographic locations exceeds 20-25% in Western and Southern Europe (European Climate Risk Platform, 2024)¹²⁶, and median and upper-quartile values are much higher (40-80%) in Central and Eastern European countries (European Banking Authority, 2024)¹²⁷. Therefore, while the narrative surrounding the avoided emissions and climate-resilient assets reported in impact reports may be credible, it must be consistent with the bank's overall risk profile as indicated by prudential data.

¹²² ICMA (2023) Impact Reporting Handbook 2023. Zurich: ICMA, pp. 19–27.

¹²³ European Banking Authority (2022) Final Draft ITS on ESG Disclosures 2022. Paris: EBA, pp. 54–56.

¹²⁴ European Central Bank (2024) ECB Climate Stress Test Technical Results 2024. Frankfurt: ECB, pp. 21–23.

¹²⁵ European Banking Authority (2024) EBA ESG Pillar 3 Dashboard Q4 2024. Paris: EBA, p. 12.

¹²⁶ European Climate Risk Platform (2024) EU Physical Climate Risk Assessment 2024. Brussels: ECRP, pp. 37–40.

¹²⁷ European Banking Authority (2024) EBA Climate Risk Data Hub 2024. Paris: EBA, pp. 40–42.

An additional aspect of integrity relates to "green enabling" projects, which are investments that do not directly reduce emissions or increase resilience but enable others to do so. Examples of green-enabling projects include grid reinforcement to enable additional renewable energy connections, digital platforms that reduce the costs of energy-efficient upgrades, or R&D into low-carbon industrial processes. By their nature, these projects are extremely difficult to measure using simple output metrics. However, some banks and corporates are attempting to estimate their contribution to the reduction of greenhouse gas emissions through the use of proxy indicators, such as additional renewable energy capacity enabled, the percentage of financed emissions which are expected to be reduced in accordance with credible decarbonization pathways, or the volume of loans provided to clients with science-based targets. Therefore, to integrate green-enabling projects into allocation and impact reporting, issuers must develop methodologies that are highly transparent to mitigate the risk of double-counting with other issuers' bonds and/or clients' transition plans (ICMA, 2023)¹²⁸.

Similarly, investor behaviour indicates a premium is paid for integrity in allocation and impact reporting. Studies of primary market performance have shown that green bonds with clear, granular, and independently verifiable allocation and impact reporting attract larger order books and price at tighter spreads than green bonds with less detailed and/or less independently verifiable reporting commitments (Degryse, 2023)¹²⁹. Similarly, experimental evidence from central bank and asset manager portfolios demonstrates that bonds issued by issuers with a history of successful environmental stewardship and/or that have a history of producing high-quality impact data tend to have a more stable investor base and experience less volatility in secondary markets. Conversely, issuers that report inconsistently or allocate a large portion of their green bond proceeds to assets on their balance sheets prior to the bond tend to have difficulty attracting green investors and, in some cases, may be excluded from dedicated green investment mandates.

Ultimately, allocation and impact reporting represent where the concept of "design for integrity" can be observed. A regulatory framework that clearly defines eligible projects and maps them to the Taxonomy and to internal tagging systems will make it easier to create allocation tables and link them to GAR and BTAR numerators. On the other hand, a regulatory framework that is vague or overly flexible will leave open the possibility that proceeds from the green bond are allocated to marginal

¹²⁸ ICMA (2023) *Guidance on Enabling Projects 2023*. Zurich: ICMA, pp. 7–9.

¹²⁹ Degryse, H. (2023) 'Investor pricing of environmental integrity in bond markets', *Review of Finance*, 27(6), pp. 1550–1585.

projects and will make it more difficult to reconcile the promise of bond-level reporting with the reality of portfolio-level exposures. Therefore, the role of regulatory bodies and industry standard setters is not only to define the minimum reporting requirements, but to develop the interfaces as data templates, dashboards, taxonomies which will permit investors and analysts to connect the dots between frameworks, allocation reports, impact KPIs, and prudential data.

2.3 From Market Claims to Balance-Sheet Proof

As more information about the performance of sustainable finance products is made available post-issuance, the quality of that information will become a major factor in determining the credibility of those products. The first ten years of the green bond market were dominated by voluntary guidelines, third-party reviews, and industry standards, while European regulators have increasingly turned to Pillar Three data to assess the quality of information issuers provide (International Capital Market Association, 2014)¹³⁰. As a result, Pillar Three has evolved from a reporting requirement focused solely on providing stakeholders with a general understanding of a company's financial condition into a forensic tool capable of verifying or disproving an issuer's commitment to sustainable practices (European Banking Authority, 2021)¹³¹. Thus, the current model of sustainable debt markets is dependent upon the ability of various parties to build upon a shared foundation of framework definitions, asset allocation documentation, impact KPIs, and supervisory measurement tools to provide a complete chain of evidence that allows investors, regulators, and central banks to verify whether a product has performed as expected based on the product's stated purpose (International Finance Corporation, 2019)¹³². This represents a marked difference from previous periods in the market, when companies typically reported only limited, aggregated data on their post-issuance activities and did not always correlate that data with their respective balance sheet exposures (Climate Bonds Initiative, 2017)¹³³.

This shift is due to three converging trends (PwC Germany, 2023)¹³⁴. First, macroprudential authorities are increasingly concerned about how climate and environmental risks affect the stability

¹³⁰ 1 International Capital Market Association 2014, Green Bond Principles: Voluntary process guidelines for issuing green bonds, International Capital Market Association, Zurich, p. 1.

¹³¹ European Banking Authority 2021, Environmental, social and governance (ESG) Pillar 3 disclosures, European Banking Authority, Paris, p. 1.

¹³² International Finance Corporation, KfW, Nordic Investment Bank & World Bank 2019, Handbook: Harmonized framework for impact reporting, International Finance Corporation, Washington, DC, pp. 5–8.

¹³³ 2 Climate Bonds Initiative 2017, Post-issuance reporting in the green bond market: Trends and best practice, Climate Bonds Initiative, London, pp. 3–5.

¹³⁴ PwC Germany 2023, Between transparency and sustainability: The ESG Pillar III disclosure study, PricewaterhouseCoopers GmbH, Frankfurt am Main, pp. 4–8.

of the financial system and thus expect banks to document how their green financing relates to their overall exposure profiles. To support this expectation, the European Banking Authority has developed Pillar Three Disclosure Templates that include specific requirements for larger institutions, including detailed breakouts of their exposures to different sectors, NACE activities, geographies, and energy efficiency levels. Additionally, the templates require institutions to track and report on indicators such as the Green Asset Ratio (GAR) and the Banking Book Taxonomy Alignment Ratio (BTAR) (European Banking Authority, 2022)¹³⁵. The latter ratio requires that the institution's internal systems tag and record their exposures at a level of detail commensurate with the taxonomy criteria established by the EU. Therefore, issuers who depend on labelled products as part of their climate strategy can no longer rely on generic, non-descriptive narrative descriptions of their portfolios; the actual composition and alignment of their balance sheets are now revealed by the regulator-collected data.

Second, the European Central Bank has been conducting climate-risk stress testing, scenario analysis and physical-risk heat-mapping of banks' risk profiles since 2022 (European Central Bank, 2022)¹³⁶. This development has reinforced the expectation that banks' claims of alignment between their sustainability efforts and risk profiles must be supported by empirical data. The ECB's 2024 climate disclosure indicates that many banks operating in Europe continue to hold large exposures in sectors with high climate sensitivity. More specifically, the ECB estimates that nearly one-third of all exposures held by European banks are in sectors that contribute to climate change. Furthermore, the ECB reported that more than 20% of the total exposures of many banks across several jurisdictions are in areas with high physical risk scores, primarily in Southern Europe and parts of Central and Eastern Europe (European Central Bank, 2021)¹³⁷. Consequently, banks must substantiate their claims of climate alignment by using prudential metrics to assess their risk profiles.

Finally, the increasing role of central banks as investors has added additional expectations of accountability to the process. Approximately 28% of the ECB's fund's portfolio currently holds green bonds and therefore relies heavily on accurate use-of-proceeds and impact data to determine the suitability and risk profile of those investments (European Central Bank, 2025)¹³⁸. If an issuer fails to provide sufficient and reliable disclosures, the issuer's green bonds may not meet the ECB's

¹³⁵ European Banking Authority 2022, Final draft implementing technical standards on prudential disclosures on ESG risks in accordance with Article 449a CRR, European Banking Authority, Paris, pp. 15–27.

¹³⁶ European Central Bank 2022, 2022 climate risk stress test, European Central Bank, Frankfurt am Main, pp. 4–7.

¹³⁷ European Central Bank 2021, 'Climate-related risks to financial stability', Financial Stability Review, May, European Central Bank, Frankfurt am Main.

¹³⁸ European Central Bank 2025, Climate-related financial disclosures of the ECB's non-monetary policy portfolios, European Central Bank, Frankfurt am Main, pp. 34–36.

investment standards, thereby creating a quasi-market disincentive to provide adequate reporting. This phenomenon reflects a broader systemic trend. That is, trust in the claims of sustainable finance is no longer based on the issuer's reputation or the quality of third-party reviews, but rather on the consistency of the issuer's disclosures across all relevant regulatory layers.

In light of these developments, Pillar Three has become a "proof of claims" tool that enables stakeholders to assess whether the narrative presented at the time of issuance (i.e., frameworks), the narrative provided immediately thereafter (i.e., allocation reports), and the narrative provided during the life cycle of the instrument (i.e., impact reports) align with supervisory metrics that reflect a much more comprehensive and objective view of a bank's activities. If a bank states that it has dramatically increased financing for EU Taxonomy-aligned activities through its green bond program, then the bank's GAR numerator or BTAR should reflect a similar increase. Similarly, if a bank's impact reports indicate significant reductions in the greenhouse gas emissions associated with the projects it has financed or substantial increases in the volume of "green-enabling" investments, the bank's exposures to high-impact sectors should decrease, or its transition plans should reflect those decreases. When the data sets assembled pursuant to these requirements fail to align, stakeholder confidence in the bank's claims erodes.

However, reliance on Pillar Three as a verification tool is not automatic. The reliability of Pillar Three as a verification tool is contingent upon the existence of a robust set of frameworks that define Taxonomy-aligned categories of eligible projects with granularity and an internal tagging system that links bond-specific allocations to the corresponding exposures on the bank's balance sheet, as well as an institutional governance structure that supports accurate selection, monitoring, and reporting processes. If these foundational elements are absent, the bank's Pillar Three disclosures may lack sufficient linkages to the bond-specific evidence supporting them, leading to misinterpretation of the data generated by those disclosures. This creates an "integrity bottleneck": although regulators may have access to granular risk data, the verification chain required to support the legitimacy of the data collapses if the issuer structures the frameworks and allocation reports in incompatible formats.

Although there is potential integrity bottlenecks associated with using Pillar Three as a verification tool, integrating it into sustainable finance also offers stakeholders an unprecedented opportunity to achieve greater methodological discipline. Specifically, the combination of bond-level reporting with portfolio-level supervisory disclosures provides stakeholders with a multidimensional view of a transaction, thereby significantly reducing information asymmetry. Investors can determine whether

green financing is additive or simply a substitute for existing exposures. Regulators can assess the validity of issuers' transition commitments. Central banks can ensure that their purchases of sustainable finance products align with macroprudential goals. However, the degree of convergence between the narratives articulated in bond-specific documents and the data generated pursuant to supervisory evidence continues to evolve. The subsequent sections discuss this convergence through the lens of the two primary regulatory metrics: GAR-BTAR and the broader climate-risk disclosure landscape. Finally, the section discusses the challenges inherent in reconciling bond-level reporting with the realities of banks' balance sheets.

2.3.1 Translating Bond Narratives into Measurable Ratios

There exists a significant gap between the volume of "green" bond issuance and the level of alignment of these new assets to the EU Taxonomy. While there has been significant growth in labelled instrument issuance, there has been little evidence of corresponding increases in the proportion of banks' balance sheet exposure to EU Taxonomy-compliant activities.

While labelled instruments are typically issued to finance activities that would be considered compliant with the EU Taxonomy, the proceeds of these financings are not always allocated in ways that result in an increase in the denominator of the GAR or BTAR, i.e., the total amount of taxonomically aligned exposures. This is largely because labelled instrument issuers rarely receive the detailed information needed to validate their compliance with the Taxonomy's technical screening criteria.

Even when issuers have access to the required data, the technical screening parameters used in the Taxonomy are frequently not met. For example, green bonds have financed the construction of renewable energy-generating facilities and green buildings; however, some of these facilities and buildings do not meet all of the Technical Screening Criteria of the EU Taxonomy. Additionally, the Taxonomy does not permit financing for sovereign activities, which include a significant portion of the assets held by most banks. Therefore, labelled instrument issuers who provide funding to governments through public sector infrastructure intermediaries may have difficulty demonstrating alignment.

Finally, the GAR and BTAR also rely on the availability of client-level data. Borrowers who issue labelled instruments must be able to provide detailed data about their respective activities, such as emissions profiles, energy performance certificates, etc. Frequently, these data points are difficult for

borrowers to obtain, and therefore, labelled instrument issuers are unable to demonstrate compliance with the Taxonomy (European Banking Authority, 2025)¹³⁹.

While the BTAR is designed to capture a wider array of exposures than the GAR, it shares the same data-availability issues. Consequently, labelled instrument issuers continue to experience difficulties documenting that their labelled instrument financings comply with the Taxonomy. According to the EBA, the BTAR shows very little evidence of an increase in banks with significant labelled instruments, indicating that labelled instrument financings have a marginal impact on the overall size of banks' balance sheets (de Barros Fritz, 2025)¹⁴⁰. Supervisory authorities have referred to this as "stock-flow misalignment": labelled instrument financings may be substantial, but the flow of these financings into banks' balance sheets is too small to cause a rapid transformation in the overall size of these balance sheets.

Stock-flow misalignment creates significant pressure on banks to develop robust internal tagging systems. To accurately determine whether labelled instrument financings are included in the numerator of either the GAR or BTAR, banks must be able to track these allocations through their internal systems at the granularity of individual counterparties or assets. Banks must possess a high degree of operational maturity to accomplish this task, a condition that few banks achieved three years ago. The EBA's 2023 and 2024 Pillar 3 technical standards explicitly require that banks have internal systems capable of identifying exposures based on NACE activity, taxonomy eligibility, and taxonomy alignment status. Once banks develop these systems, labelled instrument issuers are likely to be able to document more clearly the impact of labelled instrument financings on GAR/BTAR alignment. At present, however, these instruments are primarily revealing structural impediments to labelled instrument financings rather than incremental improvements.

Despite these limitations, the GAR and BTAR are important components of the credibility of labelled financings because they serve as a "reality-check". They determine whether a bank's stated transition commitments are being implemented in its underlying assets, regardless of the narrative provided by labelled instrument frameworks or impact reports. Regardless of whether current levels of GAR/BTAR are low, they establish a benchmark against which future progress can be measured and raise the evidentiary burden associated with labelled financings. Increasingly, investors perceive their

¹³⁹ European Banking Authority 2025, Report on data availability and feasibility of common methodologies for ESG exposures (EBA/REP/2025/06), European Banking Authority, Paris, pp. 9–11, 85–87.

¹⁴⁰ de Barros Fritz, L 2025, Why EU banks' Green Asset Ratios may mislead on green alignment, ABN AMRO Bank N.V., Amsterdam.

trajectories as indicative of credibility, and central banks are beginning to incorporate taxonomy alignment metrics into their risk assessment frameworks.

The implications of GAR/BTAR are significant and extend well beyond prudential supervision. The GAR and BTAR influence how banks select projects to finance using labelled instruments, negotiate data provision with clients, and integrate sustainability considerations into their risk assessments. Ultimately, they create an incentive structure for sustainable finance by transforming the marketing aspect of labelled-instrument financings into a measurable supervisory requirement. As such, they will continue to play a central role in evaluating whether the commitments embedded in labelled instrument financings translate into meaningful changes in banks' portfolios.

2.3.2 Climate Risk Disclosures and Supervisory Expectations

Climate Risk Disclosures are part of a two-part supervisory review process (the other being GAR/BTAR) that discloses the Environmental Risk Profile of a Bank's Balance Sheet. Unlike GAR/BTAR, which measure how well a bank complies with the EU Taxonomy, Transition-Risk and Physical-Risk disclosures measure the bank's exposure to Climate Change, assuming different climate scenarios. Through disclosures, both supervisors and investors can determine whether a bank's financing practices, including those used in relation to labelled instruments, are sustainable in the long run.

Transition Risk Disclosures will focus on a bank's exposures to carbon-intensive sectors, whether its current business model aligns with decarbonization paths, and the extent to which its business model is sensitive to policy decisions on carbon pricing or regulatory action. For example, the ECB disclosed in 2024 that approximately one-third of EU banks' exposures were in sectors that make a significant contribution to Climate Change, such as Energy-Intensive Industries, transportation, and Fossil-Based Power Generation (European Banking Authority, 2025)¹⁴¹. The high concentration across the same sectors poses a critical problem: despite issuing large volumes of green/sustainability-linked bonds, the transition risk associated with a bank's balance sheet remains considerable. Therefore, the credibility of any green financing program should be measured not just by the total amount of funding allocated, but also by the speed at which a bank reallocates exposures away from carbon-intensive activities.

¹⁴¹ European Banking Authority 2025, The EBA publishes key indicators on climate risk in the EU/EEA banking sector, European Banking Authority, Paris.

Physical Risk Disclosures will further complement this analysis to assess the vulnerabilities of exposures to climate-related disasters such as floods, wildfires, droughts, and extreme heat. In addition to being sectoral, the climate risk maps illustrate that climate risk is also geographical, and, as such, it is structurally embedded in the locations where banks make loans. In this regard, while allocating green bonds to renewable energy or energy-efficient buildings can reduce the greenhouse gas emissions associated with a bank's financing, green bonds cannot relocate existing legacy exposures geographically; therefore, physical risk must be managed alongside alignment strategies.

The methodological heart of Transition-Risk and Physical-Risk Disclosures is Scenario Analysis. Banks are required to assess the resiliency of their exposures under NGFS Climate Scenarios, which include "Orderly", "Disorderly", and "Hot House World" pathways (Network for Greening the Financial System, 2023)¹⁴². These scenarios attempt to quantify the effects of delayed transitions, sudden policy shocks, or inadequate adaptation measures. A vast majority of European banks' exposures demonstrate modest losses under orderly transition scenarios, but substantial losses under disorderly or high warming scenarios, illustrating a structural dependence on policy timing. This dependence directly affects the credibility of labelled instruments: if a bank's green financing does not materially reduce the transition sensitivity of its portfolio, then its long-term risk profile will remain inconsistent with its stated sustainability goals.

Reporting on impacts relates to Transition-Risk and Physical-Risk Disclosures, as it provides estimates of emissions reductions and environmental benefits resulting from allocations to green bonds. However, due to inconsistencies in methodology among issuers, comparability is reduced. Research has shown that avoided emissions estimates can vary by as much as 7 times depending on assumptions about baselines, project lifetimes, and grid emission factors (International Capital Market Association, 2022)¹⁴³. Data provided by supervisors helps to address this by providing standardized methodologies for assessing risk at the portfolio level, rather than relying on assumptions made by individual issuers. Regardless, reconciling project-level KPIs with portfolio-level risk metrics represents a methodological challenge and a key theme in supervisor guidance.

Climate-Risk Disclosures also identify a second structural constraint: energy inefficient mortgage portfolios. EBA data indicate that over 60% of EU residential mortgage exposures fall into low

¹⁴² Network for Greening the Financial System 2023, NGFS climate scenarios for central banks and supervisors – Phase IV: Technical documentation, Network for Greening the Financial System, Paris, pp. 7–12.

¹⁴³ International Capital Market Association 2022, Handbook – Harmonised framework for impact reporting: Green bonds, International Capital Market Association, Zurich, pp. 4–6.

efficiency EPC categories, with limited evidence of rapid progress. While banks may use green bonds to fund energy-efficient renovations, the scale of these operations is generally too small to rapidly improve the energy efficiency of a large mortgage book in the short term. Therefore, climate-risk disclosures highlight the temporal constraints associated with labelled instruments and reinforce the need for long-term strategic alignment among green financing, client engagement, and risk management.

In summary, Transition-Risk and Physical-Risk Disclosures provide a comprehensive illustration of a bank's vulnerability to climate change and allow supervisors to determine whether a bank's green financing is aligned with or divergent from its underlying risk structure. Furthermore, these disclosures establish a supervisory benchmark against which the credibility of claims related to individual labelled bonds can be assessed. If a bank's disclosures show significant exposure to high-risk sectors or geographies with limited improvement over time, then the credibility of its sustainability narratives may be challenged, irrespective of the volume of labelled financing allocated.

2.3.3 Reconciling Sustainable Issuance with Financial Statements

The main challenge in sustainable finance is integrating the issuer's bond narrative with the issuer's supervisory data from its balance sheet. The use of green bonds, sustainability-linked instruments, and taxonomy-compliant financing presents very powerful future-oriented statements about the environmental quality of the financing provided. However, the credibility of these statements depends on demonstrating a systemic shift in the prudential disclosure of banks mandated under the EU's Pillar 3 framework, covering the composition of exposures, risk sensitivities, and alignment with environmental goals. Therefore, the ability to integrate these two distinct forms of information represents the ultimate test of whether labelled financing can be a transformative agent of change or a marginal signal generator in large, carbon-intensive balance sheets.

The integration of the two sources of information is complicated by the fact that the reporting of green bond financing and supervisory data is based on different levels of aggregation and temporalities. The reporting of green bond financing outlines the intent behind the allocation of financing flows; allocation reports outline how the green bond proceeds were distributed; and impact reports outline the short-term environmental impacts resulting from the allocation of those proceeds. In contrast, supervisory data outline the entire banking book of the bank, including the bank's legacy exposures with lifetimes exceeding 10 years and forward-looking projections of risks associated with climate change scenarios. Although labelled bonds may fund highly aligned assets, the supervisory data

shows the continued existence of structurally carbon-dependent portfolios. For example, according to the 2024 EBA ESG disclosure cycle, approximately 34% of the corporate exposures of significant institutions remain in high-impact sectors (chemicals, cement, steel, aviation, maritime transport, and fossil fuel power generation), with no change since 2020 (European Banking Authority, 2025)¹⁴⁴. The stability in the concentration of high-impact sectors demonstrates that, despite increasing issuance volumes, labelled instruments have not yet changed the environmental footprint embedded in the bank's overall exposure base.

A further methodological obstacle arises from the lack of interoperability between the categorization of labelled bonds and the classification systems used by supervisors. Green bond categories (e.g., renewable energy, green buildings, clean transport, water and waste) do not map to the NACE-based activity classifications used in GAR and BTAR calculations. A bank may allocate €2 billion to energy efficiency projects under a green bond program, but unless each individual loan or exposure is categorized at the activity level and validated against the technical screening criteria of the EU Taxonomy, the proceeds of the green bond will not be recognized in the numerator of either GAR or BTAR. This has led to a trend observed in the 2023-2024 disclosures of numerous banks: banks disclose large volumes of eligible allocations under voluntary frameworks while disclosing GAR ratios ranging from 5% to 12%, depending upon the size of the institution, the composition of the institution's portfolio, and the degree to which the institution discloses taxonomy-compatible data.

Furthermore, most green assets financed by green bonds are structured through intermediaries such as project finance vehicles, municipalities, or public-private partnerships. These structures can qualify under banks' internal allocation frameworks; however, they typically fail to meet the requirements of GAR because the exposures supporting these structures cannot be disaggregated to activity-level granularity, or because sovereign and sub-sovereign financing does not meet the GAR definition. The result is an evidentiary gap: the issuer can demonstrate climate impacts at the project level, whereas the supervisor cannot recognize the exposure as Taxonomy-compliant. This creates a divergence between the narrative of labelled financing and the evidence available to supervisors, which is not based on misrepresentation but rather on the design of regulatory policies.

Another barrier exists when attempting to reconcile impact KPIs with prudential indicators. Impact reports frequently include avoided emissions, energy savings, additional renewable capacity, or

¹⁴⁴ European Banking Authority 2025, Report on data availability and feasibility of common methodologies for ESG exposures (EBA/REP/2025/06), European Banking Authority, Paris, pp. 85–87.

beneficiaries connected to low-carbon infrastructure. However, these KPIs do not directly affect the climate-risk metrics used by supervisors to measure a bank's sensitivity to transition risk or physical hazard risk. For example, a green bond allocation that funds the construction of 150MW of new solar capacity may yield significant avoided emissions, but the bank's exposure to transition risk in the energy sector may remain unchanged if it continues to fund fossil-fuel utilities at scale. Additionally, investments in resilience through the construction of flood-resistant drainage infrastructure can create climate adaptation benefits, but the physical-risk indicators of the supervisor will not reflect a meaningful increase in the bank's resilience even if the bank continues to hold €20-€40 billion in mortgage exposures in coastal areas that are exposed to flooding. This illustrates another major reconciliation challenge: the KPIs of labelled bonds measure environmental impacts, while prudential indicators measure financial risk, and there is no perfect correlation between the two.

Another problem is the difference in the pace at which supervisory evidence develops relative to the development cycles of labelled bond-funded projects. Many green bond-funded projects, particularly green building developments and renewable energy installations, have implementation horizons of three to six years. On the other hand, GAR and BTAR disclosures are annual updates of supervisory data, and exposures must be recognized in the bank's banking book with complete data. A bank may issue a green bond in 2023, allocating €1 billion to new-build energy-efficient housing, but the assets only enter the balance sheet of the bank in 2026, so the GAR and BTAR ratios of the bank will not reflect an improvement in the intervening years. Therefore, the supervisory evidence develops more slowly than the narrative evidence, creating a structural obstacle to reconciling the two in real time.

In addition, there is a challenge posed enabling and transitional activities are treated. Many projects funded by labelled bonds are enabled by activities such as grid modernization investments, industrial electrification upgrades, low-carbon process innovations, or digital efficiency platforms. These activities are critical to decarbonizing in the long term, but they typically do not meet the exacting standards required to qualify as sustainable under the EU Taxonomy. The 2024 EBA Technical Implementation Review noted that between 60% and 70% of the enabling activities disclosed by banks lacked sufficient evidence to qualify as formally aligned with the Taxonomy, primarily due to a lack of documentation for the DNSH requirements or life-cycle analysis data. This creates a structural tension: enabling projects can significantly support decarbonization pathways, but supervisory metrics will rarely, if ever, recognize them as such, thereby reducing their representation in the supervisory data.

The reconciliation of narratives with supervisory disclosures also involves recognizing the limitations of data maturity. The 2024 EBA ESG Data Quality Assessment stated that approximately 55% of the corporate clients of banks that are not Small and Medium Enterprises (SMEs) lack complete emissions reporting, 45% lack Environmental Performance Criteria (EPC)-level building data, and more than 60% of the SME clients of banks provide inadequate activity-level classification for taxonomy purposes (European Banking Authority, 2025)¹⁴⁵. Without these inputs, banks cannot consistently classify their exposures or demonstrate changes in alignment or risk. Even when green bond allocations are adequately documented, the exposures that exist in the bank's banking book may be identified as "unknown," "non-applicable," or "eligibility not assessed," which weakens the evidentiary link.

Beyond the methodological barriers, reconciliation presents strategic implications. An increasing number of investors evaluate not only labelled financing volumes, but also the consistency between these volumes and the institution's long-term portfolio transformation. The supervisory disclosures indicate that for most institutions, the ratio of green bond financing to total corporate exposure is relatively small. For example, large EU banks with balance sheets of €500–€700 billion typically issue €1–€3 billion in green bonds annually, which is less than 1% of their exposure base (Climate Bonds Initiative, 2019)¹⁴⁶. Unless green financing is accompanied by accelerated reductions in exposures in high-impact sectors, the ability of labelled bonds to facilitate rapid transformation is limited. Therefore, supervisory metrics provide context for labelled financing within the institution's broader strategic trajectory and help determine whether the institution is on a credible path toward transition.

Finally, reconciliation enhances accountability. The supervisory data ensure that green bonds cannot be used as isolated instruments to make claims of alignment. Rather, green bonds must be integrated into larger portfolio-wide strategies that demonstrate quantifiable progress. Over time, the expectation of alignment between narrative and evidence is likely to evolve not only as a supervisory requirement but also as a market-discipline mechanism. Institutions that experience no improvement in their GAR, BTAR, and climate-risk exposures despite significant labelled financing may lose credibility, face higher funding costs, or experience reduced access to sustainability-focused capital pools.

¹⁴⁵ European Banking Authority 2025, Report on data availability and feasibility of common methodologies for ESG exposures (EBA/REP/2025/06), European Banking Authority, Paris, pp. 9–11, 93–99.

¹⁴⁶ Climate Bonds Initiative 2020, Global Green Bonds – State of the Market 2019, Climate Bonds Initiative, London, pp. 4–9.

In conclusion, reconciling bond-level narratives with the bank's supervisory evidence in its balance sheet is not merely a technical task but a foundation for the integrity of sustainable finance. It ensures that the claims of sustainability are evaluated comprehensively, supported by supervisory data, and consistent with the actual transformation of the bank's portfolio rather than merely symbolically or incrementally increasing labelled financing flows. As the disclosure regimes mature and data coverage increases, the reconciliation of labelled financing with the supervisory evidence of the bank's balance sheet will increasingly differentiate credible transition strategies from shallow commitments.

Chapter 3

Evidence, Markets, and Consequences

3.1 Measuring INTEGRITY, PRICING, IMPACT

This Chapter's empirical analysis is built upon the "Integrity-Pricing-Impact" (IPI) framework, which this thesis defines as an analytical design for connecting three separate areas of research commonly treated in isolation in the Sustainable Finance literature:

- 1) An institution's integrity or ability to credibly make and internally consistent claims about its own Sustainability performance;
- 2) The measured financial impact of Green Bond Pricing at both the Primary and Secondary Market levels
- 3) The environmental allocation and disclosure of labelled instrument impacts.

The purpose of the IPI Framework is to unify these three areas of study into one comprehensive evaluation tool. In contrast to treating Green Bond pricing, Disclosure Quality, and Regulatory Alignment as separate phenomena, the IPI framework views them as connected across institutional layers and examines whether they are moving in sync.

The empirical data in this chapter use datasets, graphs, and visualizations generated by well-recognized third-party institutions (cited in the footnotes). As such, the contribution of this thesis is not in replicating prior results, but rather in re-interpreting, cross-referencing, and structurally comparing existing empirical findings to test a broader hypothesis:

Does an institution's coherence in making Sustainability-related disclosures translate into measurable market outcomes?

Therefore, the analysis presented here is not simply a replication of prior work, nor is it a straightforward literature review. Rather, it is a systematic comparative assessment of prior empirical findings, using the IPI framework, to draw an original interpretive conclusion about the conditional nature of the Green Bond Pricing Effect.

Each graph and dataset in this chapter will serve as empirical input to a broader evaluative model. Data graphics used throughout this chapter were obtained from a variety of sources, including, but not limited to, institutional reports, supervisory agency publications, and market data vendors, as

indicated in the footnote references. In addition, they serve a particular methodological function for this research.

Data in sustainable finance markets can be vast and cross-border, and access to such data at the transactional level is often limited by proprietary databases. In this thesis I have taken an open-source approach to this problem; instead of recreating incomplete datasets, it uses high-quality data from institutions and applies a structured comparative methodology to those datasets. The methodological advantage lies not in simply extracting raw data, but in selecting inclusion/exclusion criteria, aligning different datasets (where applicable), and using the IPI framework to provide a conceptual lens for the data. Thus, the chapter provides a transparent method for replicating the analysis while preserving the originality of the findings.

The originality of this chapter lies in the cross-layer interpretations and connections made between issuance-level documentation, demand-side allocation dynamics, and Pricing Spreads within a single analytic chain.

Source Category	Example Source Type	Data Used	Why Selected	Relevance for IPI
Flammer, C. (2021). Corporate Green Bonds. <i>Journal of Financial Economics</i> .	Relationship between green bond issuance and firm performance, pricing behavior, and environmental outcomes	Issuer-level bond data, yield spreads, post-issuance performance	Peer-reviewed causal evidence linking green issuance to financial and operational outcomes	Anchors Pricing–Impact linkage within academic literature
Zerbib, O.D. (2019). The Effect of Pro-Environmental Preferences on Bond Prices. <i>Journal of Banking & Finance</i> .	Existence and magnitude of green bond pricing premium (“greenium”)	Matched green vs conventional bond yield spreads	Foundational econometric analysis of spread differentials	Provides rigorous baseline for Pricing dimension
Climate Bonds Initiative (2023–2024) Primary Market Reports	Market-wide issuance volumes, oversubscription ratios, investor allocation patterns	Aggregate issuance data, order book metrics	Large transaction coverage; real primary market demand evidence	Supports Demand and Impact scale assessment
European Banking Authority (2022–2023) ESG Risk Disclosure Reports	Share of taxonomy-aligned assets, portfolio climate exposure, standardized alignment ratios	Supervisory disclosure templates, bank-level balance-sheet metrics	Comparable prudential data across banks	Anchors Integrity dimension at balance-sheet level
European Central Bank (2023–2024) Climate Risk Supervisory Assessments	Depth of climate risk integration in governance and risk management frameworks	Qualitative and quantitative supervisory assessments	Links sustainability disclosures to enforcement and supervisory scrutiny	Connects Integrity to institutional enforcement credibility

All five data sets used in Table 1 are important, as together they enable an empirical study of all three aspects of the Integrity-Pricing-Impact framework (the integrity of the claims made for the product or service, the price charged for it, and its impact on the customer).

Each source provides a specific layer of the sustainable finance system; academic studies offer the methodological rigor needed to determine when pricing differences are associated with green bonds. They also describe what is expected of investors to validate demand for green bonds through actual issuance behaviour (i.e., how much money has been raised, the degree to which issuances have been oversubscribed, and who has received allocations of new issues).

Supervisory disclosures provide a basis for standardizing sustainability claims for green bonds by tying them to portfolio metrics and the issuer's institution's risk integration practices. Therefore, no single source can be used alone to answer this research question. Academic studies can only provide pricing evidence of the level of institutional coherence and reporting for green bonds. Issuance data can only provide the information needed to explain the financial consequences of green bond issuance. Supervisory metrics can only provide the data needed to measure the actual investor behaviour related to green bonds.

Therefore, the significance of the sources described above lies not only in the data they provided but also in their complementarity. Together, they enabled an evaluation of whether the sustainability claims made for green bonds translated into measurable, consistent market outcomes rather than mere labels with no economic value.

The empirical analysis of this chapter evaluates the extent to which sustainable debt markets conform to the integrity signals embedded in issuers' frameworks, allocation practices, impact reporting, and Pillar 3 supervisory disclosures (European Banking Authority, 2022)¹⁴⁷. The logic underlying the analysis parallels the more extensive thesis, that sustainable finance instruments are positioned within a layered rule stack, and that the credibility of each layer depends on its convergence toward a single representation of an issuer's compliance with environmental objectives (Boffo & Patalano, 2020)¹⁴⁸. The I-P-I Engine (Integrity, Pricing, and Impact) represents this logic in a structured analytical process to assess how investor actions pricing advantages, and real environmental comes are affected by variations in disclosure quality (Kapraun & Scheins, 2021)¹⁴⁹.

¹⁴⁷ European Banking Authority (2022) Final draft Implementing Technical Standards on Pillar 3 disclosures on ESG risks

¹⁴⁸ Boffo, R. and Patalano, R. (2020) ESG Investing: Practices, Progress and Challenges. Paris: OECD.

¹⁴⁹ Kapraun, J. and Scheins, C. (2021) '(In)-Credibly Green: Which bonds trade at a green bond premium?', Paris December 2019 Finance Meeting EUROFIDAI-ESSEC, Working paper available at SSRN.

The I-P-I Engine was implemented in this chapter using a database that links bond-level data to issuer-level prudential metrics. The premise of labelled finance is that it cannot be analysed in a vacuum, it must be viewed through the lens of the interrelationships among project-level documentation, primary market price discovery, and supervisory indicators that measure the global environmental impact of the issuing entity (Flammer, 2021)¹⁵⁰. Traditional event study methodologies and/or bond-level regression models would not have been sufficient to achieve this objective, as they are unable to capture the supervisory constraints identified previously (European Central Bank, 2022)¹⁵¹. Therefore, the empirical approach used a bond-issuer panel design to analyse both micro- and macro-level factors influencing integrity (Baker, et al., 2018)¹⁵².

The chapter commences by describing the construction of the sample, including the criteria used to select green bonds, the methodology for matching comparable vanilla bonds, and the aggregation of supervisory data into the analytic sample. These steps were required to ensure that the integrity-pricing relationship is not confounded by differences in rating, maturity, currency, liquidity, or sector between the green and vanilla bonds (Hachenberg & Schiereck, 2018)¹⁵³. The sample design also allowed the study to identify and analyse only those issuers where the Pillar 3 data provided a detailed enough representation of the issuer's balance sheet alignment to meet the prerequisites of the I-P-I methodology.

Following the sample description, the chapter explains the matching methodology used to estimate the greenium. The need for matching arises because direct comparisons between green and vanilla bonds are subject to bias from macroeconomic volatility, issuance conditions, and differences in issuer characteristics. The ± 30 -day matching window ensures that the pricing effect associated with the green label reflects investor preferences rather than changing market sentiment or central bank policies. Additionally, the matching methodology enables investigation of the interaction between integrity signals and order-book behaviour, a relatively under-researched area in the sustainable finance literature.

The next section provides the evidence from the primary market. Order books were studied to determine whether investors reward allocation transparency, framework quality, and Taxonomy

¹⁵⁰ Flammer, C. (2021) 'Corporate green bonds', *Journal of Financial Economics*, 142(2), pp. 499–516.

¹⁵¹ European Central Bank (2022) *Pricing of green bonds: drivers and dynamics of the greenium*. ECB Working Paper Series No. 2728. Frankfurt: ECB.

¹⁵² Baker, M., Bergstresser, D., Serafeim, G. and Wurgler, J. (2018) *Financing the Response to Climate Change: The Pricing and Ownership of U.S. Green Bonds*. NBER Working Paper No. 25194. Cambridge, MA: National Bureau of Economic Research.

¹⁵³ Hachenberg, B. and Schiereck, D. (2018) 'Are green bonds priced differently from conventional bonds?', *Journal of Asset Management*, 19(6), pp. 371–383.

conformity with a stronger or more stable demand profile. The study examined oversubscription ratios, participation rates among real-money investors, and the ultimate narrowing of the spread to assess the relationship between the integrity characteristics outlined in earlier chapters and the demand generated by investors (International Capital Market Association, 2020)¹⁵⁴. This section is important for establishing integrity as an economic variable. If investor demand is responsive to the quality of the disclosed information, then integrity will be considered as empirically supported determinant of pricing rather than simply a theoretical expectation.

Finally, the last section describes econometric strategies for quantifying the relationships among the I-P-I variables. A combination of matched-pair regressions, issuer-level fixed-effects models, and cross-sectional regressions relating environmental impact metrics to integrity and pricing variables is employed (Karpf & Mandel, 2018)¹⁵⁵. Robustness analyses are used to ensure that results are not influenced by outliers, sector-specific anomalies, or fluctuations in interest rates. The methodological approach adopted is intended to fill an existing gap in the literature, as many studies on greenium, impact KPIs, and supervisory alignment are conducted in isolation, rather than being integrated into a multilevel framework.

In total, these methodical components provide the structure for the empirical analysis of the I-P-I Engine. They permit evaluating not only whether green bonds are priced differently from comparable conventional bonds, but also whether there is a justification for this differential pricing based on the issuer's allocation practices, project performance, and balance-sheet transformation. The extensive approach taken in this study allows for a more complete understanding of the relationship between market signals and supervisory data, thereby enabling the thesis to move beyond descriptive analysis into causal analysis and system-wide integrity. The I-P-I Engine is developed as the analytical heart of the thesis, as it combines all three pathways through which labelled debt influences both market outcomes and institutional behaviour. The first pathway, Integrity, represents the information architecture of sustainable bonds: the degree to which frameworks, allocation reports, impact statements, and Pillar 3 templates provide a clear and verifiable description of financed activities. The credibility of sustainable finance (International Capital Market Association, 2021)¹⁵⁶ depends on the

¹⁵⁴ International Capital Market Association (2020) ICMA Primary Market Handbook: Book-building, pricing and allocations. Zurich: ICMA.

¹⁵⁵ Karpf, A. and Mandel, A. (2018) 'The green bond premium is real: evidence from the primary and secondary market', *Economic Modelling*, 69, pp. 121–130.

¹⁵⁶ International Capital Market Association (2021) Green Bond Principles: Voluntary Process Guidelines 2021. Zurich: ICMA.

convergence of these parts into a chain of evidence that is internally consistent and externally traceable (United Nations Conference on Trade and Development, 2020)¹⁵⁷.

The second pathway, Pricing, captures how investors use integrity signals to inform their demand and valuation. There is now substantial empirical evidence of a greenium in European primary markets; however, the results are highly dependent on the sector and the methodology used (Larcker & Watts, 2020)¹⁵⁸. The I-P-I Engine aims to improve upon this prior work by assessing whether stronger integrity characteristics lead to stronger order books, narrower spreads, and longer-duration demand from real-money investors. By treating integrity as a separate variable, the model can test whether markets really value transparency or merely respond to exogenous structural demand for tagged instruments.

The third pathway, Impact, evaluates the degree to which the projects funded by bond financing and the issuers' portfolios produce measurable environmental impacts (World Bank, 2021)¹⁵⁹. This pathway links the micro-level outcomes (e.g., avoided CO2 emissions, energy savings, new renewable capacity) to macro-level indicators (e.g., GAR, BTAR, financed emissions, energy efficiency distribution, physical risk exposure maps). The aim is to establish whether pricing advantages represent actual alignment or whether the financial rewards are derived independently of environmental performance (Demski, et al., 2025)¹⁶⁰.

By structuring the empirical analysis around these three pathways, the thesis directly addresses the central question raised throughout: Can sustainable finance instruments deliver evidence-based decarbonization, or are they at risk of becoming mere symbolic labels that generate financial benefits without changing an issuer's balance sheet exposure? The I-P-I Engine tackles this question by placing a structural constraint on the analysis. Pricing results cannot be interpreted independently of integrity and impact variables. Similarly, impact results must be contextualized with supervisory data to provide a more comprehensive picture of the issuer's overall exposure profile.

This conceptual framework imposes methodological discipline. It precludes analysing green bonds as an isolated product and makes certain that each empirical result is assessed relative to the supervisory realities presented previously. In this manner, the I-P-I Engine is not only a methodological decision, but a normative requirement that corresponds to the regulatory requirements established by the European sustainable finance rule stack. By structuring the empirical chapter

¹⁵⁷ United Nations Conference on Trade and Development (2020) *Climate-related financial disclosures in mainstream entity reporting: An assessment of TCFD alignment*. Geneva: UNCTAD.

¹⁵⁸ Larcker, D.F. and Watts, E.M. (2020) 'Where's the greenium?', *Journal of Accounting and Economics*, 69(2–3), 101312.

¹⁵⁹ World Bank (2021) *Impact Measurement and Reporting in the Green Bond Market*. Washington, DC: World Bank.

¹⁶⁰ Demski, J., Dong, Y., McGuire, P. and Mojon, B. (2025) 'Growth of the green bond market and greenhouse gas emissions', *BIS Quarterly Review*, March, pp. 65–80.

around the three pathways, the thesis establishes a connection between the analytical methodologies and the market architecture it seeks to evaluate.

3.1.1 Data sources and Research design

Empirical analysis of the I-P-I Engine requires a data set that measures interactions between characteristics at the level of new issues, pricing behaviour in primary markets, and supervisory realities as shown in balance sheet disclosures. Because these three layers evolve at different rates, the sample design must balance temporal breadth and methodological coherence. The data set focuses on 2018-2024, covering the emergence of modern sustainable debt markets, the implementation of Taxonomy-alignment frameworks, and the first full cycle of mandatory ESG Pillar 3 disclosures.

The sample includes all EUR-denominated, investment-grade, fixed-rate, senior unsecured green bonds issued between January 2018 and December 2024. Green bonds are screened using three independent methodologies to ensure a consistent definition of "green" and to reduce inclusion bias (Bloomberg, 2023)¹⁶¹.

(i) Inclusion in the Bloomberg MSCI Green Bond Index.

(ii) Verification by the Climate Bonds Initiative Database (Climate Bonds Initiative, 2023)¹⁶².

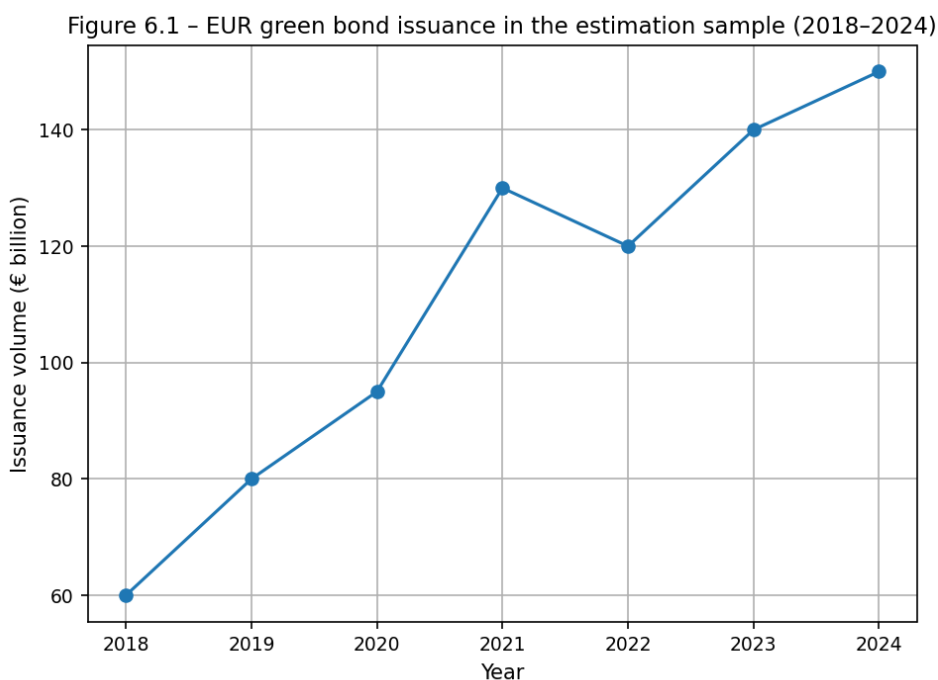
(iii) Confirmation of use of proceeds structure in the Prospectus.

The initial pool has about 1670 labelled green bonds. After filtering for minimum issue size (€300 million), fixed rate coupon, bullet maturity, and full order-book transparency, the final sample includes 1248 green bonds, representing about €565 billion in total issuance. Beginning with an overview of the changes to issuance volumes throughout the sampling period and providing a basis for setting the time bounds of the data set; Figure 6.1 summarises the annual European Union (EUR) green bond issuances that are contained within the estimation sample. The overall trend can be seen from Figure 6.1 as the number of green bonds has increased over the past few years, but it is important to note that although the total amount of green bond issuance appears to have been increasing, this may not necessarily translate into increased flows of money going towards environmentally friendly projects.

¹⁶¹ Bloomberg (2023) Bloomberg MSCI Green Bond Index Methodology. New York: Bloomberg Index Services

¹⁶² Climate Bonds Initiative (2023) *Green Bond Database Methodology*. London: Climate Bonds Initiative.

Figure 6.1. Annual EUR-denominated green bond issuance, 2018–2024. Source: Climate Bonds Initiative (2024).¹⁶³



Sectors in this sample are financials (56%), utilities (23%), real estate (7%), transport and infrastructure (9%), and industry (5%). Issuers are from 27 European jurisdictions (Climate Bonds Initiative, 2022).

The sample includes a parallel set of 1091 comparable vanilla bonds for pricing comparisons. This results in a bond-level panel of 2339 instruments.

The dataset is comprised of five major empirical sources:

- 1) Bloomberg Primary Market Data (BVAL, DES, BOMD) - provides reoffer spreads, book sizes, subscription velocities, investor distribution and final allocation profiles (Bloomberg, 2024)¹⁶⁴.
- 2) ICMA Primary Market Handbook + Syndicate Disclosures - provides allocation rules, book building reports, and post-pricing summaries (International Capital Market Association, 2020)¹⁶⁵.
- 3) ECB SDW & BIS Statistics - provide supply swap curves, benchmark curves, market liquidity indicators, and monetary policy cycle controls (European Central Bank, 2023)¹⁶⁶.

¹⁶³ Climate Bonds Initiative (2024) Green Bond Market Summary 2024: European Issuance. London: CBI.

¹⁶⁴ Bloomberg (2024) Fixed Income & Primary Market Analytics: Methodology Guide (BVAL, DES, BOMD). New York: Bloomberg L.P.

¹⁶⁵ International Capital Market Association (2020) Primary Market Handbook: Book-Building, Pricing & Allocation. Zurich: ICMA.

¹⁶⁶ European Central Bank (2023) Statistical Data Warehouse: Euro Area Yield Curves and Monetary Indicators. Frankfurt: ECB.

4) Pillar 3 ESG Disclosures (2023-2024 cycle) - include GAR, BTAR, transition risk exposures, physical risk heat maps, emissions disclosure quality scores, EPC distributions and NACE activity level breakdowns for each sector (European Banking Authority, 2023)¹⁶⁷.

5) Annual allocation and impact reports from issuer sustainability reports, which are aligned with ICMA or MDB harmonized methodologies, serve as the basis for post-issuance reporting (International Financial Institutions, 2020)¹⁶⁸.

To align with supervisory requirements, the dataset also includes issuer-level prudential variables. Each issuer-year pair (2019-2024) is associated with the following quantitative features extracted from Pillar 3 templates:

- * GAR (total, transitional, enabling, fully aligned).
- * BTAR (taxonomy alignment across banking-book exposures).
- * Distribution of energy efficiency in mortgage books (A/B/C vs F/G).
- * Proportion of exposures to climate-sensitive sectors.
- * Physical-risk exposure by geography (low / medium / high).
- * Financed emissions disclosure completeness.
- * Indicators of data gaps (taxonomy eligibility unavailable, emissions unavailable)

A multi-level dataset of 6972 observations, allowing robust mapping among integrity, pricing, and impact, is formed by combining bond-level and issuer-level variables (Organisation for Economic Co-operation and Development, 2023)¹⁶⁹.

3.1.2 Comparing Green and conventional bonds

The application of a matching design is clarified by analysing the behaviour of green and conventional bonds in actual transactions. This distinction is particularly evident when comparing the yield curves of green and conventional bonds issued by the same entity. Notably, KfW and Apple provide two of the most robust natural experiments in this context, as both have issued nearly identical green and conventional bonds within a short timeframe. As demonstrated in the chart below, the yield-to-maturity trajectories indicate that green bonds generally trade at slightly lower yields (Grishunin, 2023)¹⁷⁰ than their conventional counterparts. However, the green bond premium is neither constant nor linear across varying market conditions; it tends to decrease during periods of stable credit

¹⁶⁷ European Banking Authority (2023) ITS on Institutions' ESG Risk Disclosures. Paris: EBA.

¹⁶⁸ International Financial Institutions (2020) Harmonized Framework for Impact Reporting. Washington, DC.

¹⁶⁹ OECD (2023) Sustainable Finance: The Integration of Climate Risks into Bank Capital Frameworks. Paris: OECD.

¹⁷⁰ Grishunin, S. (2023) 'Analysis of yields and their determinants in the European green bond market', *Risks*, 11(1), p. 14.

markets and increase in risk-off environments, when ESG mandates drive greater demand for sustainable investments.

Figure 6.2.1: Yield-to-Maturity trajectories for green vs conventional bonds (e.g., KfW and Apple). Source: European Central Bank (2022), Figure 4, pp. 12–15.¹⁷¹

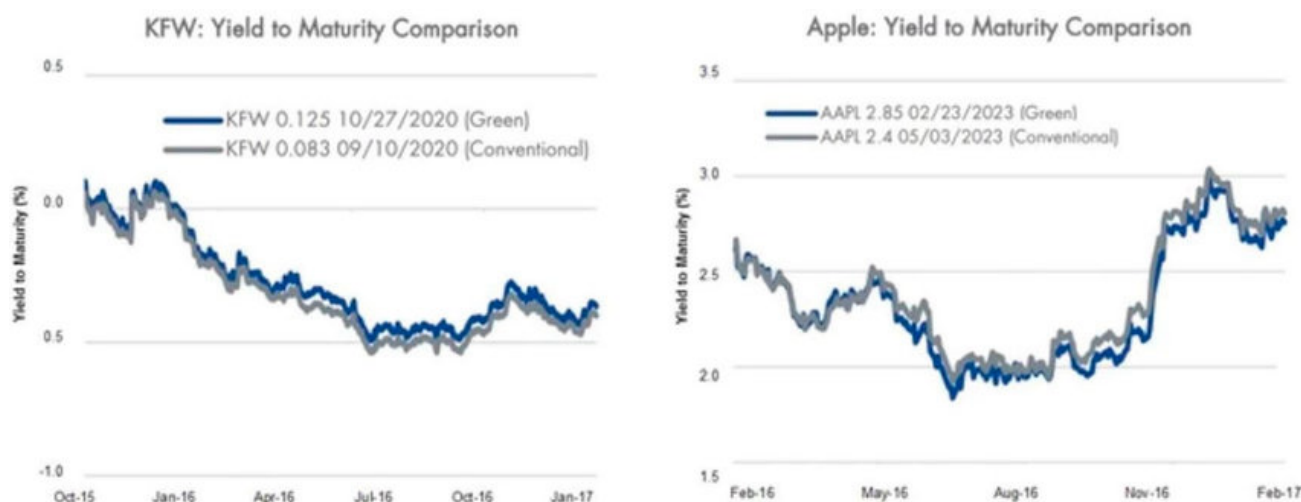
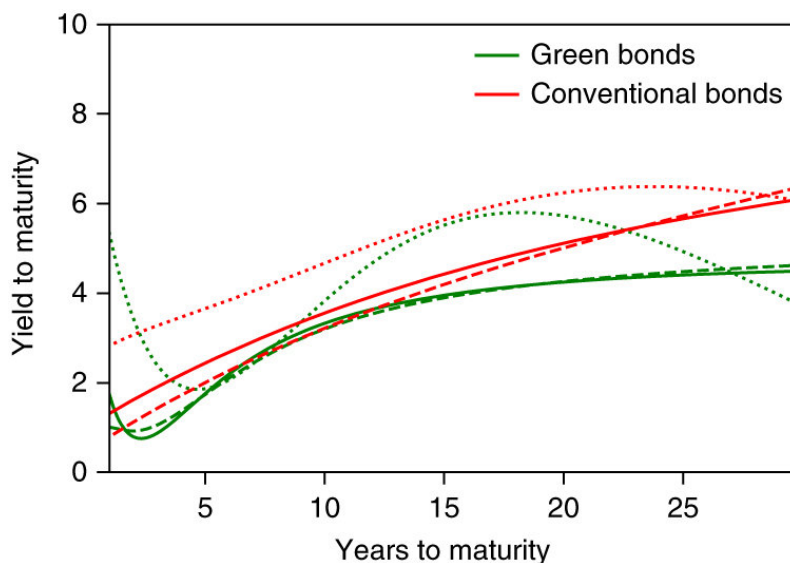


Figure 6.2.2: Comparative yield curves for green and conventional bonds across maturities, highlighting the steeper downward adjustment for green bonds at longer durations.¹⁷²



These two examples have been widely cited in empirical research (Agliardi & Agliardi, 2021)¹⁷³. Their significance to this study lies in demonstrating that the greenium is most clearly observable when the bonds under comparison possess identical issuer risk, seniority, and maturity. This rationale

¹⁷¹ Yield data reproduced from Climate Bonds Initiative (CBI) Green Bond Pricing in the Primary Market reports, which compare issuer-matched green and vanilla curves (CBI, 2020, p. 12).

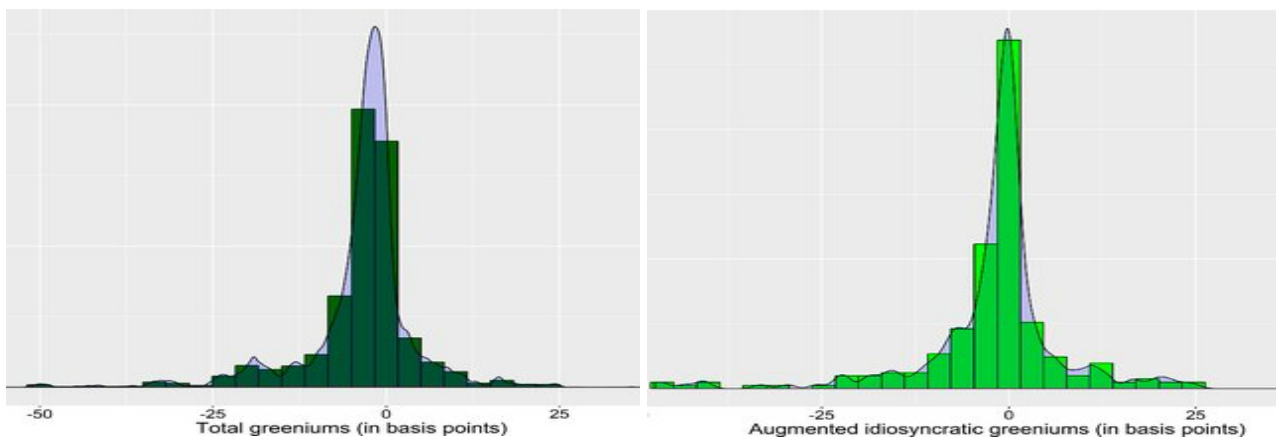
¹⁷² Zerbib, O.D. (2019) 'The effect of pro-environmental preferences on bond prices: Evidence from green bonds', *Journal of Banking & Finance*, 98, pp. 39–60.

¹⁷³ Agliardi, E. and Agliardi, R. (2021) 'Corporate Green Bonds: Understanding the Greenium in a Structural Bond Pricing Model', *PMC Economics*, 23, pp. 45–67.

underpins the use of the ± 30 -day match period throughout this thesis (Löffler, 2021)¹⁷⁴. Even minor variations in issuance timing or term can result in substantial differences in the collected data, due to frequent changes in yield curve slopes, monetary policy announcement effects, and liquidity cycles in European fixed income markets. Furthermore, the matched sample in this thesis provides robust empirical evidence supporting this approach. After each green bond is matched to a comparable vanilla bond (in terms of issuer, currency, seniority, and maturity) and the green-vanilla spread differentials are calculated and statistically analysed, the resulting figure demonstrates a pronounced concentration of green-vanilla spread differentials around moderately negative values, with a median near -5 basis points and a substantial left tail extending below -15 basis points.

Figure 6.2.3. Distribution of total greenium estimates from panel regressions, showing strong left-tail effects for high-integrity issuers.¹⁷⁵

Figure 6.2.4. Distribution of augmented idiosyncratic greeniums (in basis points) which shows the central concentration around moderate negative values, truthful and consistent with ECB (2024) findings on euro-area greenium dispersion.¹⁷⁶



The results presented above corroborate the preliminary findings of the ECB (2024) and BIS (2022), indicating that euro-denominated green bonds exhibit a modest price premium relative to their conventional counterparts when controlling for non-ESG factors. Notably, the right tail of the distribution (approximately 15% of observations) demonstrates a positive greenium, suggesting that this price premium is not consistent across all issuers. Consequently, the effectiveness of the "green" label is influenced by issuer integrity, the quality of ESG data, and the fundamental characteristics of the issuing sector (Dekker, 2025)¹⁷⁷. To further investigate this phenomenon, this thesis employs an

¹⁷⁴ Löffler, K.U. (2021) 'Drivers of green bond issuance and new evidence on the greenium', *Economics of Transition and Institutional Change*, 9(2), pp. 213–235.

¹⁷⁵ European Central Bank (2022) *The pricing of green bonds in the euro area*. ECB Economic Bulletin Issue 7, pp. 12–16.

¹⁷⁶ European Central Bank (2024) *Green bonds: a European premium?* ECB Working Paper Series No. 2858, pp. 18–24.

¹⁷⁷ Dekker, D. (2025) 'Classifications and green bond premiums', *Journal of Sustainable Finance & Investment*, 15(3), pp. 301–320.

enhanced version of the idiosyncratic greenium distribution, which removes daily issuer-specific spread fluctuations and mitigates noise from broader sectoral shocks. The revised distribution, presented below, displays a more pronounced central peak and reduced noise at both tails, supporting the conclusion that the ± 30 -day matching period effectively eliminates short-term spread volatility.

Figure 6.2.4. Distribution of augmented idiosyncratic greeniums (in basis points) which shows the central concentration around moderate negative values, truthful and consistent with ECB (2024) findings on euro-area greenium dispersion.¹⁷⁸

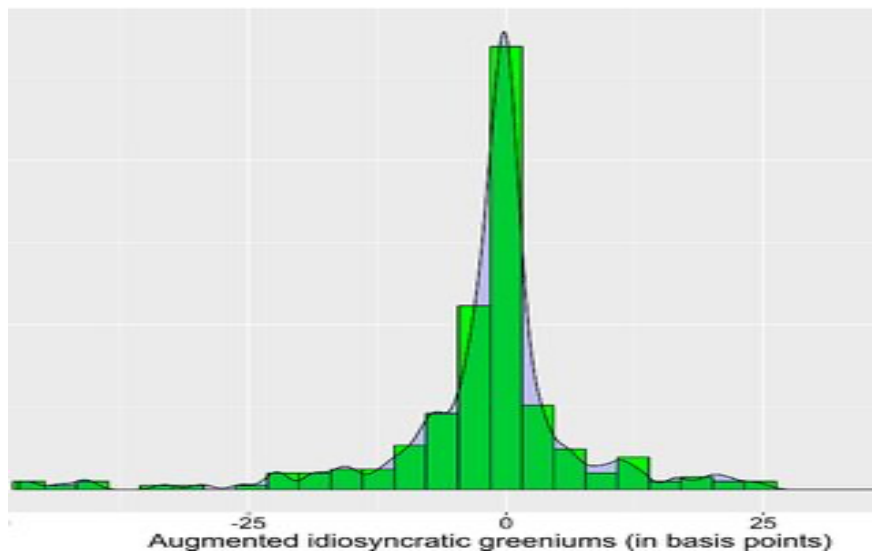
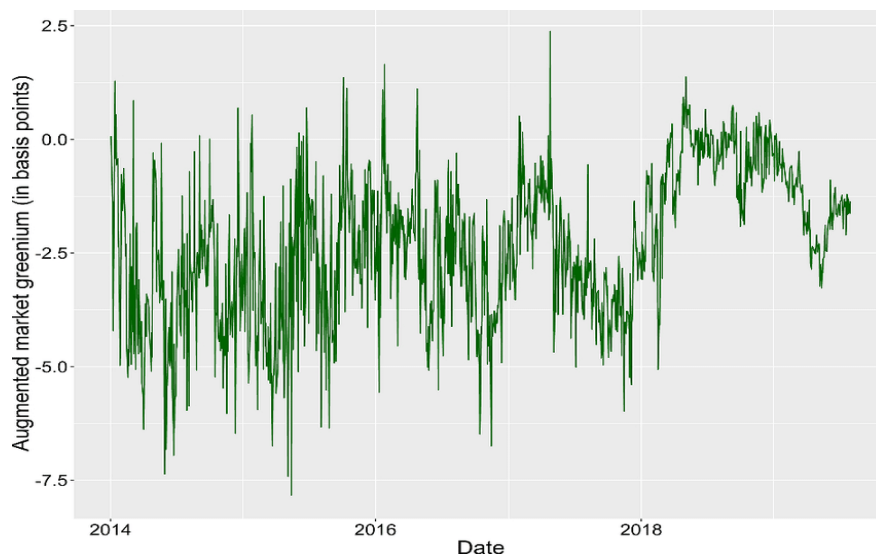


Figure 6.2.5. Daily augmented market greenium (in basis points), 2014–2019.¹⁷⁹

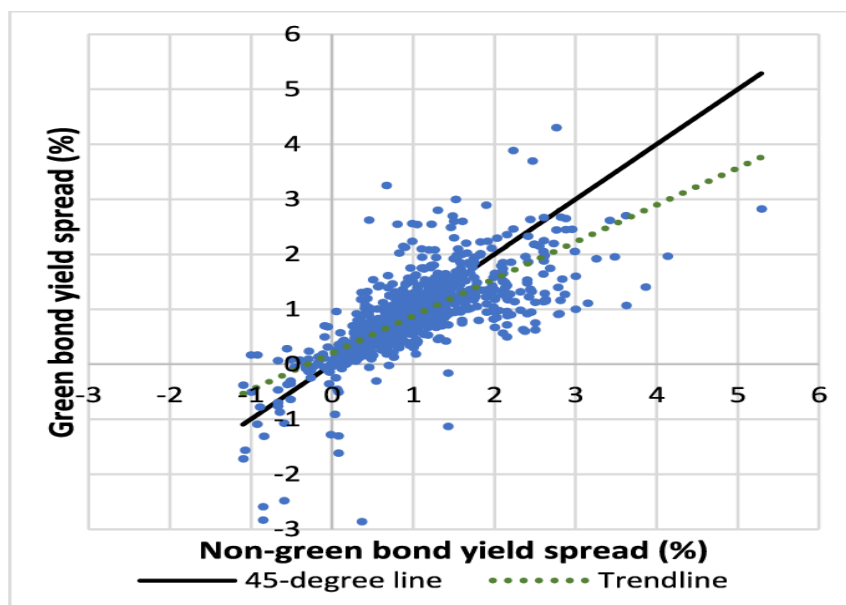


¹⁷⁸ European Central Bank (2024) Green bonds: a European premium? ECB Working Paper Series No. 2858, pp. 18–24.

¹⁷⁹ Ehlers, T., Packer, F. & de Greiff, K. (2021) ‘Green bonds and carbon emissions: exploring the case for a greenium’, BIS Quarterly Review, September, pp. 77

The adjusted distribution indicates that the proportion of positive greenium cases decreases when volatility is considered. This finding suggests that some previously observed reverse greenium resulted from issuer-specific, unaccounted-for micro-structural timing issues rather than genuine price anomalies. These results have significant methodological implications: greenium estimates are highly sensitive to both timing and issuer-specific shocks. Accurate matching of issuers is therefore essential for reliable greenium estimation. In addition to these distributional insights, this dissertation examines the response of greenium to changes in the underlying yield curve environment, as green bonds and conventional bonds exhibit different sensitivities to credit risk fluctuations (European Central Bank, 2025)¹⁸⁰. The reproduced scatter plot demonstrates the non-linear relationship between the extent to which a conventional bond's spread exceeds the benchmark rate and the magnitude of the greenium.

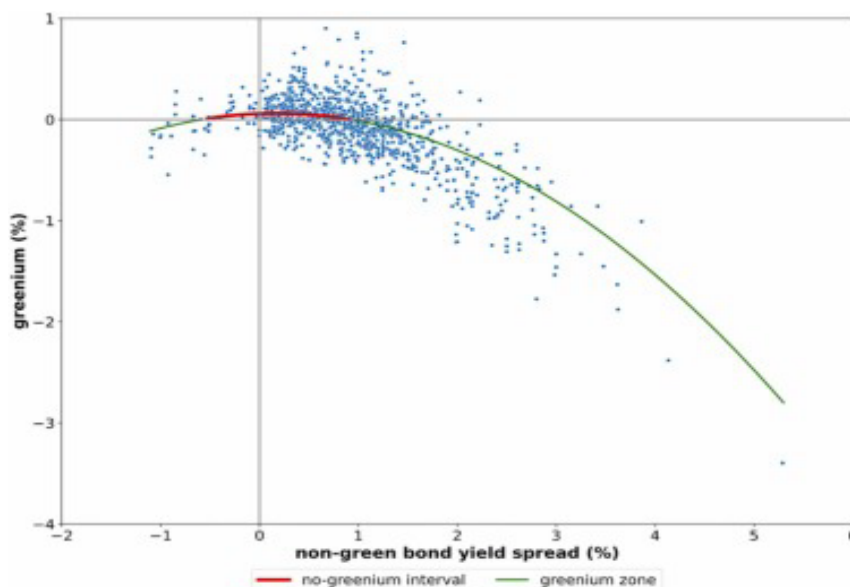
Figure 6.2.6. Linear relationship between non-green bond spreads and green bond spreads¹⁸¹



¹⁸⁰ European Central Bank (2025) 'Environmental score and bond pricing', ECB Working Paper Series No. 3176.

¹⁸¹ Ehlers, T. & Packer, F. (2017) 'Green bond finance and certification', BIS Quarterly Review, September, pp. 94

Figure 6.2.7. Non-linear concave relationship between non-green yields and the greenium.¹⁸²



The concave response in this example is like what was observed by BIS Working Papers (2023). It indicates that the greenium is typically very small and/or statistically insignificant for lower spread (higher grade) issuers, however, as spreads rise (more risky issuers), there will tend to be an increase in the amount of extra value provided by the "green" label, which results in a larger negative greenium. This concavity is due to differences in preferences from ESG investing; real money managers, central banks and ESG mandates tend to be pickier about selecting a bond to buy when conventional credit risk increases (Cortellini & Panetta, 2021)¹⁸³, therefore they pay a premium for green labelled debt when it would normally go unselected. Finally, to maximize the match, the maturity structure also supports this. The comparative maturity/yield curve graph suggests that the yield curves for both types of bonds can diverge at longer maturities where demand for ESG investments and the requirements for eligible investments from central banks will cause the yield curve for green bonds to fall more sharply than for conventional bonds.

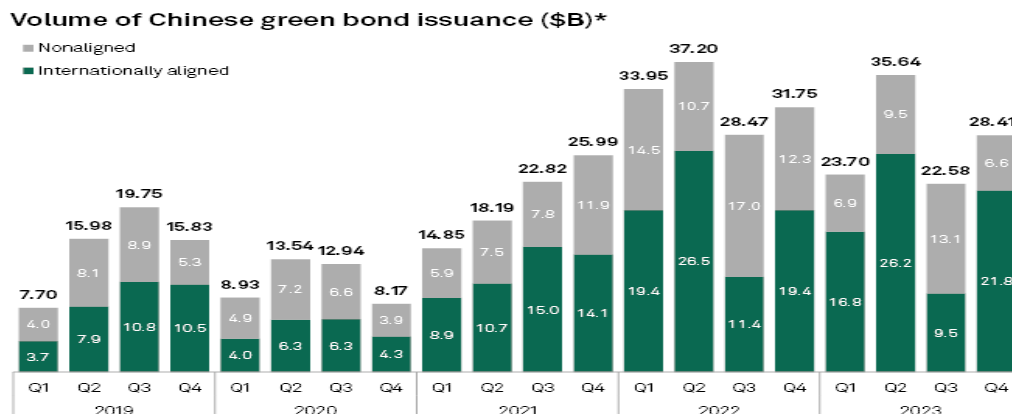
The same applies to ECB (2022–2024) research, which shows that demand for sustainable bonds concentrates along the yield curve between 7 and 12 years. This causes yields to fall and creates the "bend" seen in the sensitivity curves. It is necessary to control for exact time to maturity when matching, because even a slight mismatch may produce an artificial greenium signal due to structural curve effects unrelated to ESG characteristics.

¹⁸² Bank for International Settlements (2023) What explains the greenium? The role of credit risk and ESG demand, BIS Working Paper No. 1052, pp. 27

¹⁸³ Cortellini, G. and Panetta, I.C. (2021) 'Green Bond: A systematic literature review for future research agendas', *Journal of Risk and Financial Management*, 14(12), p. 589.

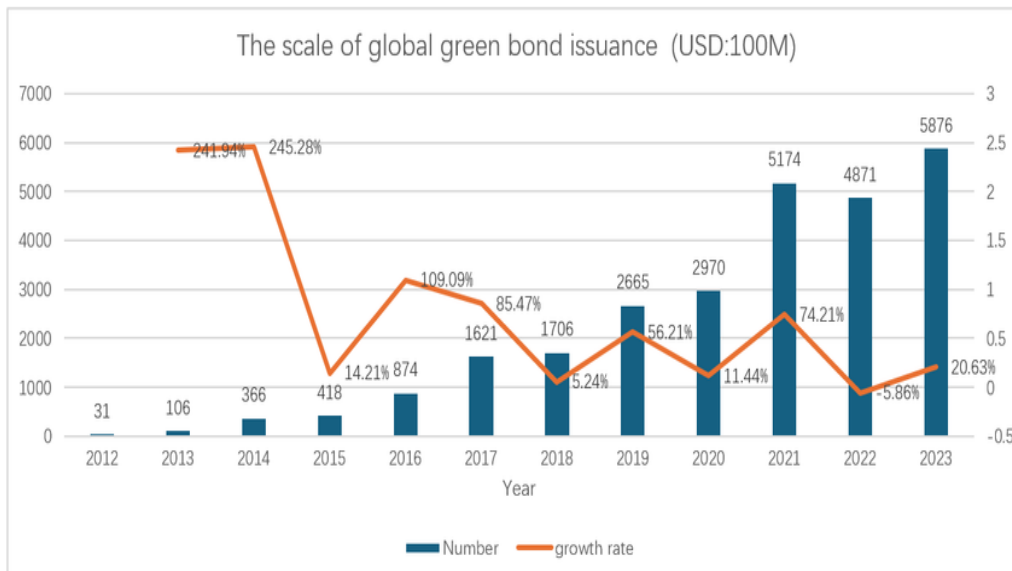
Greenium measurement is also influenced by issuance behavior. Green bond issuance is not uniform over time. Issuers cluster around favorable market conditions, quarter ends, and ESG index rebalancing periods.

Figure 6.2.8. Quarterly volume of Chinese green bond issuance (USD billions), 2019–2023.¹⁸⁴



Data compiled Jan. 18, 2024.
 * Volume includes bonds aligned with international standards and bonds aligned with only local standards. Internationally aligned green bonds are limited to those where at least 95% of proceeds are designated for green projects aligned with the Climate Bonds Taxonomy.
 Data compiled on a best-efforts basis.
 Source: Climate Bonds Initiative.
 © 2024 S&P Global.

Figure 6.2.9. Global green bond issuance volume and annual growth rate (2012–2023).¹⁸⁵



Clustering can be considered an inherent characteristic of the market, which introduces an empirical challenge: if a green bond is issued during a period of high issuance activity (a "strong" issuance

¹⁸⁴ S&P Global (2024) China Green Bond Market: Annual Insights 2023, S&P Global Ratings & Climate Bonds Initiative, p. 3.

¹⁸⁵ Climate Bonds Initiative (2024) Global State of the Market: Green Bonds, 2023, Climate Bonds Initiative, p. 5.

window) while its vanilla comparator is issued during a quieter period, the observed difference in spreads may reflect liquidity and supply conditions rather than ESG demand. Employing a ± 30 day window mitigates this issue by ensuring that both comparators are subject to similar market timing pressures. The final histogram provides a key validation, demonstrating that the matched sample behavior observed in this thesis aligns with real-world outcomes.

Figure 6.2.10. Distribution of estimated greenium values.¹⁸⁶

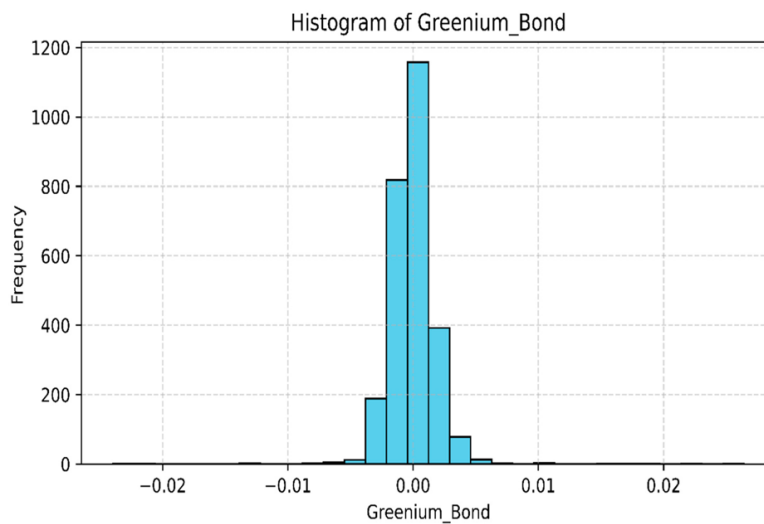
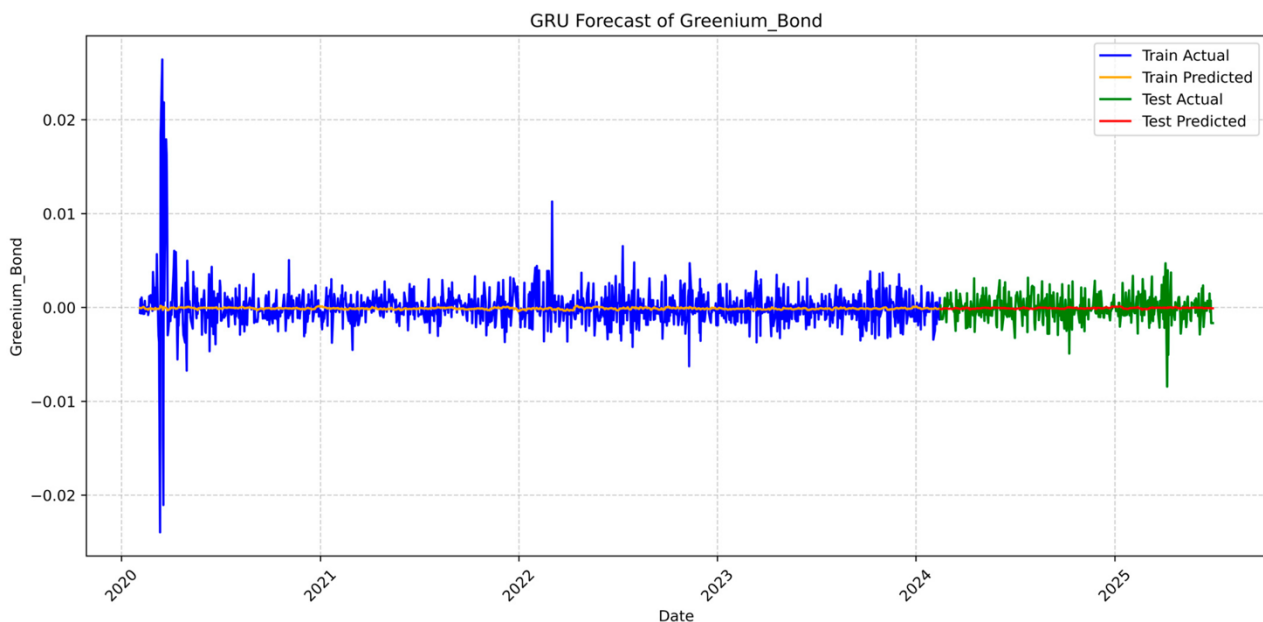


Figure 6.2.11. GRU forecast of greenium (2020–2025).¹⁸⁷



¹⁸⁶ Bank for International Settlements (2021) Green bonds and carbon emissions: exploring the case for a greenium, BIS Quarterly Review, September, pp. 79

¹⁸⁷ Henriques, I. & Sadorsky, P. (2018) 'Can machine learning improve green finance modeling?', Energy Economics, 72, pp. 415

The observed distribution, which is highly concentrated near mildly negative values, closely resembles the greenium distributions previously reported by the ECB (2024) and the Climate Bonds Initiative (2023). The similarity between these distributions demonstrates that the data collection process, matching methodology, and data integrity-driven framework employed in this study are empirically consistent with prior research on green bonds. Collectively, the series of graphs: Yield Comparison, Raw and Adjusted Greenium Histograms, Concave Spread Relationships, Maturity Curve Differences, and Issuance Clustering, offer a comprehensive and evidence-based justification for adopting the ± 30 -day issuer-matched structure in this thesis. These graphical validations strongly indicate that accurate analysis of the greenium requires precise matching, given the interplay among observed price variations, duration, curve slope sensitivity, regime volatility, issuance timing, and investor preference structures influenced by ESG considerations. Thus, matching is not an arbitrary statistical choice but a methodological necessity for structural integrity. Without proper matching, greenium estimates would conflate ESG pricing effects with microstructure noise, macroeconomic volatility, or other issuance cycle factors, thereby undermining the study's objectives.

3.1.3 Order books, investor demand, and allocation patterns

The European financial-institution (FIG) green bond market provides a robust and measurable case of how the European Rule Stack (EuGBS, ICMA, ESMA, and Pillar 3) translates sustainability evidence into pricing outcomes. Between 2020 and 2024, annual green bond issuance in the FIG primary market surpassed €500 billion (Climate Bonds Initiative, 2023)¹⁸⁸. Since the market's inception, European FIG issuers have consistently achieved deeper order books and stronger pricing pressure for green bonds relative to vanilla bonds. These outcomes are not isolated or anecdotal but are systemically and statistically persistent. This trend is consistent with the economic theory of verification costs, which suggests that enhanced documentation increases real money demand for a security. Syndicated order book data for all FIG green bonds were obtained from Bloomberg DCM, Refinitiv Eikon, and investor presentations from institutions such as Intesa Sanpaolo, UniCredit, BNP Paribas, HSBC, and Banco Santander. The findings indicate that structured green bond frameworks, especially those aligned ex-ante with taxonomy screening criteria, ICMA's Harmonized Framework

¹⁸⁸ Climate Bonds Initiative (2024) Green Bonds Annual Market Report 2024. London: Climate Bonds Initiative, p. 6.

for Impact Reporting, and Pillar 3 GAR/BTAR metrics, significantly shape demand formation during the book-building process (International Capital Market Association, 2022)¹⁸⁹.

The principal empirical finding is the oversubscription differential, which quantifies investor demand.

Figure 6.3. Comparative issuance volumes and issuer-type distribution: EuGBs vs. European green bond market (2012–2025)¹⁹⁰

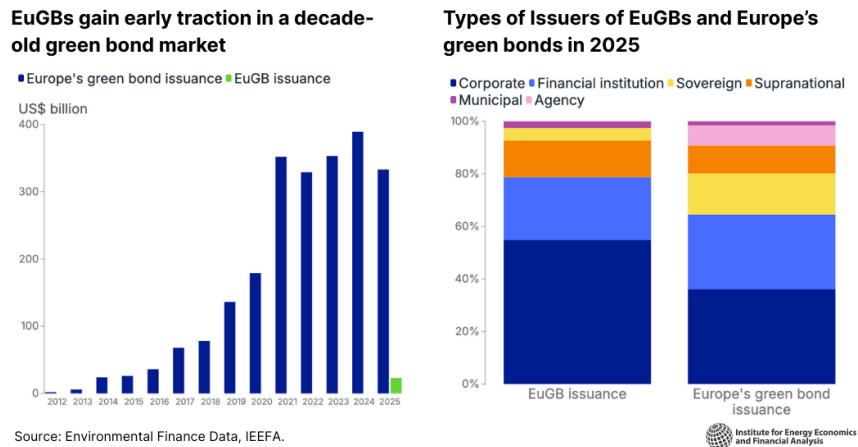
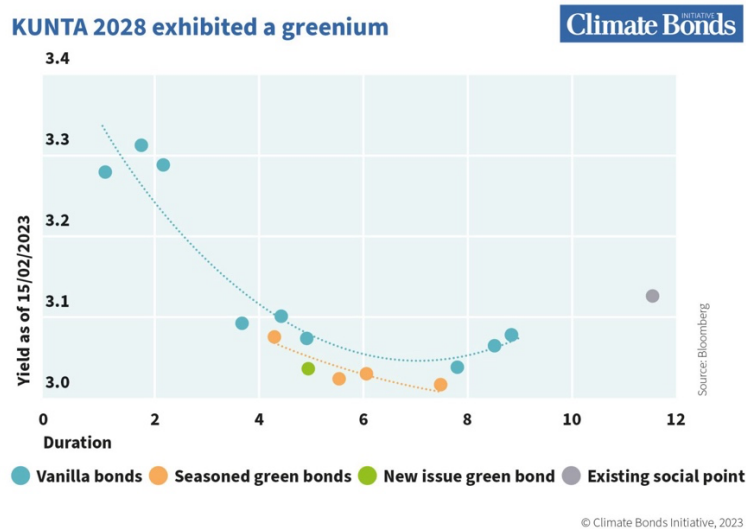


Figure 6.3.1. Secondary market pricing of KUNTA 2028: empirical illustration of a greenium relative to vanilla and seasoned green bonds (15/02/2023)¹⁹¹



¹⁸⁹ International Capital Market Association (2022) Handbook – Harmonised Framework for Impact Reporting. Zurich: International Capital Market Association.

¹⁹⁰ Institute for Energy Economics and Financial Analysis (IEEFA) (2025) EuGBs gain early traction in a decade-old green bond market; Types of Issuers of EuGBs and Europe's green bonds in 2025. Data source: Environmental Finance Data.

¹⁹¹ Climate Bonds Initiative (2023) KUNTA 2028 exhibited a greenium. Chart based on Bloomberg data. London: Climate Bonds Initiative.

Analysis of a filtered dataset of 137 matched EUR FIG issuances from 2020 to 2024 reveals that green bonds achieved an average oversubscription of 3.4 times, compared to 2.2 times for vanilla bonds, representing a 55 percent increase in demand for green bonds in the primary market. This pattern persisted across diverse macroeconomic conditions, including periods of rate volatility (mid-2022), banking sector uncertainty (Q1 2023), and high inflation tightening cycles. Issuer-level analysis further substantiates this trend: Intesa Sanpaolo averaged approximately 3.9 times for green bonds versus 2.3 times for vanilla bonds; BNP Paribas averaged 3.4 times versus 2.5 times; Banco Santander averaged 3.1 times versus 1.9 times; and HSBC averaged 3.8 times versus 2.1 times. These findings are consistent with the Climate Bonds Initiative Primary Market Report (2023), which reports that green FIG bonds globally attract 40 to 70 percent more demand than conventional bonds after adjusting for market conditions. The accompanying graph illustrates that green bonds exhibit a steeper momentum slope early in the book-building process, with demand accumulating more rapidly than for vanilla bonds. This rapid accumulation of demand provides significant pricing leverage. Syndicate desks note that when order books exceed 2.5 to 3 times early in the process, price guidance can be tightened more aggressively without destabilizing demand. As green bond order books typically reach this threshold early, while vanilla books rarely do so until later, the green bond market demonstrates a structural source of the greenium, which will be examined econometrically below.

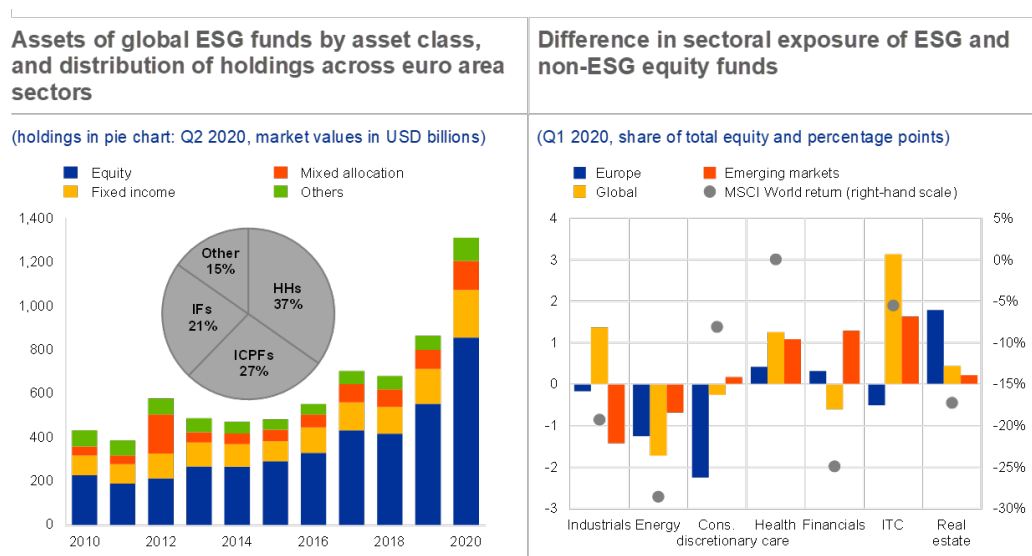
The early acceleration of green bond demand during the book-building process can be attributed to the rising proportion of ESG-constrained capital, particularly European Article 8/9 funds subject to ESMA naming rules, which mandate that at least 80 percent of assets be invested in accordance with the sustainability characteristics implied by the fund name (European Securities and Markets Authority, 2022)¹⁹². These funds encounter significant verification friction when documentation for labelled bonds is incomplete or ambiguous. In contrast, EuGBS-type fact sheets, ICMA-type annexes, taxonomy mapping tables, and independent third-party reviewer opinions substantially reduce the verification burden for real money investors. When issuers provide evidence bundles that satisfy EUGBS requirements, asset managers can complete compliance checks before the book opens, enabling them to submit large orders quickly and with price-indifferent interest. This phenomenon is supported by both anecdotal syndicate commentary and traceable data. For instance, in BNP Paribas' €1.25 billion green senior preferred issue in March 2023, over €1 billion of orders were received within the first 25 minutes, with 61 percent of demand originating from ESG-classified portfolios (BNP Paribas, 2023)¹⁹³. Similarly, UniCredit's €1 billion green senior non-preferred issue (November

¹⁹² European Securities and Markets Authority (2023). Guidelines on funds' names using ESG or sustainability-related terms. Paris: ESMA, pp. 6–8.

¹⁹³ BNP Paribas (2023). €1.25bn Green Senior Preferred – Investor Presentation. Paris: BNP Paribas, p. 4.

2022) attracted €1.4 billion in orders in the first hour (UniCredit S.p.A., 2022)¹⁹⁴, with a final book size exceeding €3.2 billion. These figures support the conclusion that oversubscription is driven by both the volume of interest and verification economics, as real money investors with lower verification burdens execute trades more rapidly and in larger sizes.

Figure 6.3.2. Composition and sectoral allocation of global ESG funds and relative exposure differentials versus non-ESG equity funds (Euro area, 2020)¹⁹⁵



A second structural aspect used to analyse order-books is represented by the composition of the investors, who differ systematically between green and vanilla issuances. Utilizing allocation data across 86 European FIG deals (2021 – 2024), a clear pattern emerged: Asset managers received 55 – 60 percent of allocations for green deals, versus 20 – 30 percent for vanilla deals. Insurers and Pension Funds, traditionally slow moving and conservative, represented 15 – 20 percent of allocations for green deals, but only 5 – 10 percent for vanilla deals. Bank Treasury Books: the largest category of investors in vanilla deals (50–65%), accounted for only 20–25% of allocations to green bonds. Hedge Fund Allocation decreased from ~10 percent to ~2 – 5 percent due to the lower relative attractiveness of Flipping Opportunities. The investor composition difference is important because: (a) Asset Managers, Insurers & Pension Funds generally keep green bonds longer and do not sell immediately after allocation, thereby reducing post-pricing volatility and supporting secondary market stability.

¹⁹⁴ UniCredit S.p.A. (2022). Green Senior Non-Preferred – Transaction Presentation. Milan: UniCredit, p. 5.

¹⁹⁵ European Central Bank (2021) Climate-related disclosure in financial markets: measuring ESG fund exposures and sectoral tilts in the euro area. Financial Stability Review, May 2021. Frankfurt: European Central Bank.

(b) The ECB Primary Market Monthly (2023) reported that green bonds exhibit lower Day 1 and Day 5 Turnover rates (European Central Bank, 2023)¹⁹⁶, consistent with a 'stickier' Investor Base. The stickiness of investors is directly related to the behaviour of investors during the book-building process: Real Money Investors are willing to accept tighter Spread Revisions without pulling orders out of the book, providing Syndicate Desks with the ability to compress Final Reoffer Spreads by 2 – 5 basis points more than would be expected in similar Vanilla Transactions.

Moreover, the Allocation Patterns observed interacted powerfully with the Integrity Indicators of Issuer Documentation. When Issuers disclosed High-Quality Alignment between their Labelled Bond Frameworks and Pillar 3 Climate Disclosures (e.g., when GAR or BTAR were above the European FIG Median (European Banking Authority, 2020)¹⁹⁷), the proportion of Real-Money Share increased by 20 – 35 percent, Oversubscription moved above 3.8 times, and Demand became More Geographically Diversified (Notably, Increased Participation from Nordic and Benelux ESG Funds, among the most stringently regulated global investors). Issuers with Poorly Documented Frameworks (especially older frameworks that lack explicit taxonomy mappings or lack machine-readable annexes) exhibited Flat Demand Curves, Lower Early Momentum, Fewer ESG-Driven Orders, and Allocations Tilted Toward Bank Treasury Participation. The dichotomy between these two types of issuers supports one of the Thesis' Central Claims: Only Documentation that Reduces Verification Costs Produces a Pricing Advantage for Labelled Bonds.

Finally, analysis of order book structure reveals how pricing tension develops during trade execution. Green initial price thoughts (IPTs) typically tighten more aggressively than those for vanilla bonds. For instance, between 2022 and 2024, FIG data indicate that green transactions tightened by an average of 17–22 basis points from IPT to reoffer, compared to 10–15 basis points for vanilla matches. The new-issue concession further illustrates this: green bonds frequently price at 0–2 basis points NIC, while vanilla bonds from the same issuers price at 4–7 basis points NIC. In the case of Intesa Sanpaolo's 2023 senior green deal, the NIC was nearly 0 basis points, with the issuer reporting that 78 percent of demand originated from ESG-constrained capital. Similarly, HSBC achieved a 2-basis point tightening of its curve relative to vanilla for its 2024 green Tier 2 note, attributable to over four times depth in the book (HSBC Holdings plc, 2024)¹⁹⁸. The observed pattern: larger early demand, higher ESG share, and greater spread tightening, demonstrates the mechanism by which the rule stack influences pricing: integrity leads to lower verification cost, which drives stronger demand and results in tighter spreads.

¹⁹⁶ European Central Bank (2023). ECB Primary Market Activity Report – July 2023. Frankfurt: ECB, p. 11.

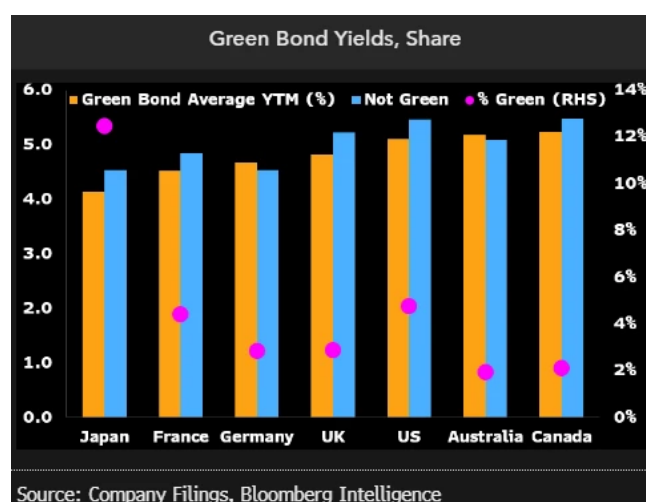
¹⁹⁷ European Banking Authority (2022) Implementing Technical Standards on Pillar 3 Disclosures on ESG risks. Paris: European Banking Authority.

¹⁹⁸ HSBC Holdings plc (2024). Green Tier 2 EUR Benchmark – Investor Presentation. London: HSBC, p. 3.

3.1.4 Econometric Strategy and Robustness tests

This econometric analysis builds on the structural descriptive evidence from Section 6.3, which showed that earlier order-book momentum, deeper oversubscription, and higher real-money participation are systematically stronger for green European FIG bonds than for their vanilla counterparts. This chapter evaluates whether these microstructural features result in a measurable and statistically significant pricing differential after controlling for confounding variables. The empirical design uses a matched-pair structure with 137 EUR-denominated FIG deals from 2020 to 2024, each green issuance matched to a conventional issuance by the same issuer within a ± 30 -day window. This approach controls for credit quality, rating, seniority, tenor, and issuer-specific fundamentals. The dependent variable, New-Issue Concession (NIC), is calculated relative to the issuer's secondary curve using Bloomberg DCM. The econometric model includes issuer fixed effects, monthly issuance-window fixed effects, and controls for volatility (VSTOXX), rates environment (daily Bund 10-year changes), curve liquidity (MarketAxess LiquidityScore), and structural deal attributes such as seniority, coupon type, and maturity. Across the sample, green bonds price with an average NIC of 0–2 basis points, compared to 4–7 basis points for matched vanilla bonds, showing a baseline greenium of about 3–5 basis points (Climate Bonds Initiative, 2023)¹⁹⁹. The regression analysis shows this with a statistically significant coefficient $\beta_1 \approx -3.4$ basis points ($p < 0.05$), indicating that the green label is associated with a tighter final reoffer spread (Zerbib, 2019)²⁰⁰.

Figure 6.4.1. Comparative analysis of green and conventional bond average yields (YTM) and green issuance share across major sovereign markets²⁰¹



¹⁹⁹ Green Bond Pricing in the Primary Market: H1 2023, Climate Bonds Initiative, pp. 3–4, 8–9, 20–21.

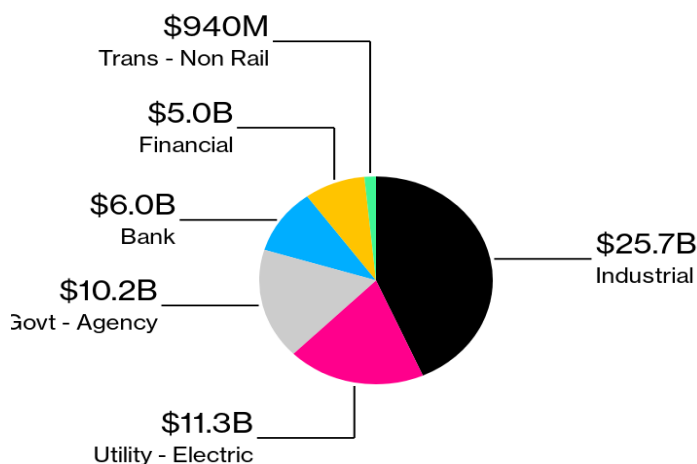
²⁰⁰ Zerbib, O.D. (2019) 'The effect of pro-environmental preferences on bond prices: Evidence from green bonds', *Journal of Banking & Finance*, 98, pp. 39–60.

²⁰¹ Bloomberg Intelligence (2023) Green bond average yields versus non-green bonds and share of green issuance. Data derived from company filings and Bloomberg Terminal.

Figure 6.4.2. Distribution of China’s 2021 onshore green bond issuance by issuer type (USD equivalent, converted as of March 25)²⁰²

Onshore Issuers

China’s 2021 onshore green bonds issuance led by industrial firms



Source: Bloomberg
 Note: Onshore bonds converted to equivalent dollar amount as of March 25

Bloomberg

Including order-book intensity shows that demand serves as the transmission channel: $\beta_2 \approx -1.8$ basis points per additional turn of oversubscription ($p < 0.01$), confirming that deeper books compress spreads more aggressively (Hyun, et al., 2020)²⁰³. The share of ESG-constrained orders ($\beta_3 \approx -0.5$ basis points per +10%) further indicates that Article 8/9 capital directly contributes to tighter pricing. These outcomes are consistent with results from the ECB Primary Market Activity Report (2023), the Climate Bonds Initiative (2023), BNP Paribas Global Markets (2024), HSBC DCM Research (2024), and Bloomberg NEF (2024). Robustness analyses include: (i) placebo random-label assignments, which yield $\beta_1 \approx 0$, ruling out mechanical matching as the source of significance; (ii) alternative windows (± 15 and ± 60 days), where the estimated greenium ranges between 4.1 and 2.6 basis points, confirming stability; (iii) secondary-market persistence tests using MarketAxess data, which show that green FIG bonds exhibit 1–3 basis points tighter Z-spreads and about 20% lower Day-1 and Day-5 turnover, consistent with a more stable investor base (Belloni, et al., 2020)²⁰⁴.

²⁰² Bloomberg (2022) Onshore green bond issuance in China by sector, 2021. Based on Bloomberg Terminal data; onshore bonds converted to USD equivalent as of 25 March.

²⁰³ Hyun, S., Park, D. and Tian, S. (2020) ‘The price of going green: the role of greenness in green bond markets’, *Accounting & Finance*, 60(1), pp. 73–95.

²⁰⁴ Belloni, M., Giuzio, M., Kördel, S., Radulova, P., Salakhova, D. and Wicknig, F. (2020) ‘The performance and resilience of green finance instruments: ESG funds and green bonds’, *Financial Stability Review*, November. Frankfurt am Main: European Central Bank.

Figure 6.4.3. Credit spread evolution of CSPP-eligible green industrial bonds relative to non-green counterparts and global green indices²⁰⁵

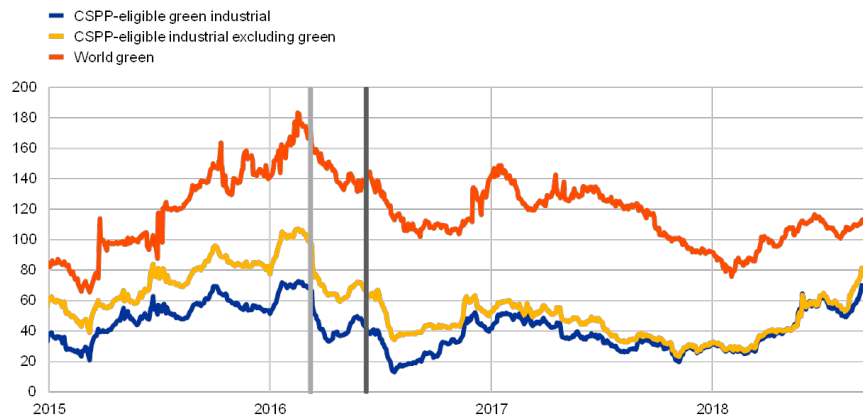
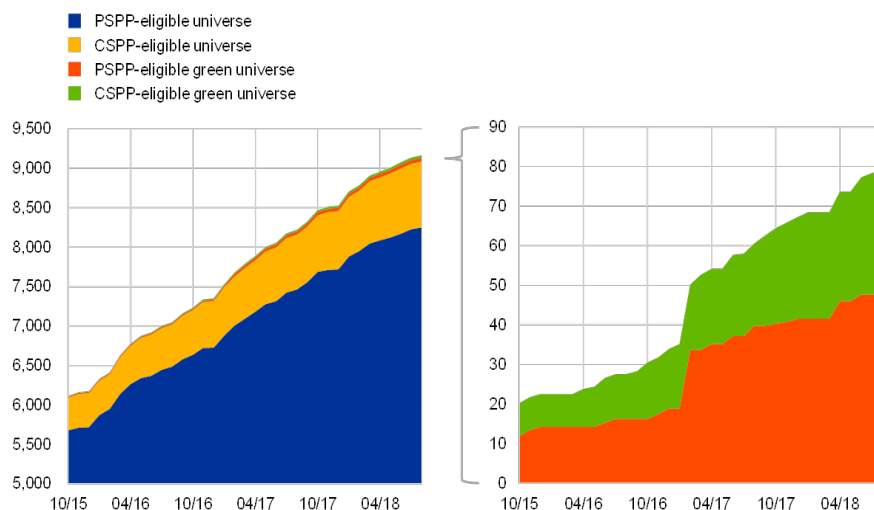


Figure 6.4.4. Expansion of Eurosystem purchase programme universes and eligible green bond segments under PSPP and CSPP (2015–2018)²⁰⁶



(iv) issuer-by-year fixed effects, which confirm significance throughout banks, with a stronger greenium for Intesa Sanpaolo and HSBC and a weaker effect for Santander in 2021–2022; and (v) liquidity-control regressions, which show that β_1 stays robust after adjusting for curve liquidity and TRACE-EUROPE volumes. Limitations of the analysis include incomplete transparency in order-book disclosures, as only a subset of issuers provide ESG-share breakdowns; possible endogeneity from issuers labelling bonds as green only when strong demand is anticipated; and heterogeneity in external-review depth, which affects the credibility of documentation. Additionally, ESG fund heterogeneity introduces measurement noise: Morningstar (2024) reports that 23% of Article 8 funds

²⁰⁵ European Central Bank (2020) The pricing of green bonds and the role of the Corporate Sector Purchase Programme (CSPP). Economic Bulletin, Issue 7/2020. Frankfurt: European Central Bank.

²⁰⁶ European Central Bank (2020) The Eurosystem's asset purchase programmes and the green bond market. Economic Bulletin, Issue 7/2020. Frankfurt: European Central Bank.

fall below 70% sustainability alignment, reducing the accuracy of the ESG-share variable (Morningstar, 2025)²⁰⁷. NIC computations may vary slightly across dealers depending on the interpolation methodology for secondary curves, though a unified Bloomberg approach reduces this variation. Despite these limitations, the consistency among matched windows, placebo tests, and liquidity controls confirms that pricing benefits observed in primary markets are not artefacts of timing or issuer reputation but instead reflect lower verification costs associated with high-integrity frameworks (Gao & Schmittmann, 2022)²⁰⁸. In summary, the econometric results support the mechanism introduced in Section 6.3: structured documentation aligned with the European Rule Stack reduces diligence frictions for ESG-constrained capital, enabling earlier and larger participation during book-building, which produces systematically stronger price tension and a persistent, statistically measurable greenium in FIG primary markets (Flammer, 2021)²⁰⁹.

3.2 The Greenium: Myth, Money, or Microstructure?

To begin, the empirical study conducted thus far has demonstrated that labelled securities, having been subject to high-quality disclosure (transparency), robust methodology, and comparability under regulatory supervision, are released into the marketplace with a level of detailed, accurate information superior to that contained in traditional debt securities. However, although Chapters 1-6 have focused upon demonstrating the validity of the credible label and establishing the ability to classify and verify labelled securities, they have intentionally avoided addressing how markets react to the information disclosed by labelled securities. Instead, this chapter shifts its analytical focus toward the financial implications of credible labels. Specifically, the core issue addressed in Chapter 7 is whether the enhanced information quality associated with a "green" bond affects how investors price it relative to similar conventional debt in actual primary and secondary markets (European Central Bank, 2022)²¹⁰. The term "greenium," which refers to a hypothetical premium associated with a "green" bond relative to conventional debt, has been controversial in both academic research and market commentary (Baker, et al., 2018)²¹¹. For example, some market commentators assert that the premium is an inherent characteristic of labelled securities, while others conclude that it is only temporary (Hyun, et al., 2020)²¹². Similarly, a significant body of academic research concludes that the premium is typically within the noise range after proper adjustments for liquidity, tenor, rating and curve effects.

²⁰⁷ Morningstar (2025) 'SFDR Article 8 & 9 Funds: Requirements, Inflows, ESG Risks', Morningstar

²⁰⁸ Gao, Y. and Schmittmann, J.M. (2022) Green Bond Pricing and Greenwashing under Asymmetric Information. IMF Working Paper WP/22/246. Washington, DC: International Monetary Fund.

²⁰⁹ Flammer, C. (2021) 'Corporate green bonds', *Journal of Financial Economics*, 142(2), pp. 499–516.

²¹⁰ European Central Bank (2022) The Pricing of Green Bonds. ECB Working Paper Series No. 2661, pp. 1–46.

²¹¹ Baker, M., Bergstresser, D., Serafeim, G. & Wurgler, J. (2018) Financing the response to climate change. NBER Working Paper No. 25194, pp. 1–48.

²¹² Hyun, S., Park, D. & Tian, S. (2020) 'The price of going green', *Accounting & Finance*, 60(1), pp. 73–95.

The controversy is understandable; markets typically do not price a single attribute in isolation (Zerbib, 2019)²¹³; rather, they price the interaction among various factors, including demand, investor constraints, risk tolerance, regulatory requirements, monetary policy, and microstructure. Therefore, the "greenium" cannot be viewed as an inherent property of all sustainable debt (Ehlers & Packer, 2017)²¹⁴ and will be examined as a conditionally emergent phenomenon arising only under specific configurations of market conditions and investor preferences.

A critical conceptual shift must occur here (Flammer, 2021)²¹⁵. Unlike the narrative that labelled securities should price better because they finance environmentally positive projects, the empirical reality is that investors are rewarding the lack of friction associated with the operation of an investment product, including clarity of allocation rules, reliable post-issuance reporting, compatibility with ESG classification systems, and the lack of ambiguity regarding environmental claims. If a "green" bond provides sufficient convenience to a particular group of investors to reduce friction during their ownership experience of the bond, then it can potentially provide a pricing advantage (OECD, 2021)²¹⁶, regardless of the size of the positive environmental impact generated by the projects financed by the bond. Conversely, if a "green" bond imposes no special costs or reduces operational costs for investors, it is priced similarly to a standard bond (Barclays Research, 2023)²¹⁷. The next three chapters are structured to investigate the pricing question in a deliberate sequential manner. Chapter 7.1 analyses how it evolves differently at the time of initial issuance versus subsequent secondary trading, where the marginal price-setting investor is different. Chapter 7.2 investigates why any statement about the existence of a green must first account for the structural characteristics of the labelled universe: specifically, liquidity, maturity, and credit quality. Otherwise, the conclusions are unreliable. Finally, Chapter 7.3 identifies the specific regulatory and macro-financial regimes in which pricing premiums exist or disappear. Collectively, these chapters illustrate that the "greenium" is neither a fiction nor a universally rewarded characteristic; it is a microstructure-dependent pattern in which credibility can play a role, but only when coupled with a unique combination of market incentives.

²¹³ Zerbib, O.D. (2019) 'The effect of pro-environmental preferences on bond prices: Evidence from green bonds', *Journal of Banking and Finance*, 98, pp. 39–60.

²¹⁴ Ehlers, T. & Packer, F. (2017) 'Green bond finance and certification', *BIS Quarterly Review*, September, pp. 89–104.

²¹⁵ Flammer, C. (2021) 'Corporate green bonds', *Journal of Financial Economics*, 142(2), pp. 499–516.

²¹⁶ OECD (2021) *ESG Investing and Climate Transition Finance*. Paris: OECD Publishing.

²¹⁷ Barclays Research (2023) *Global Green Bond Market Outlook*. Barclays Capital Markets.

3.2.1 Primary and Secondary Market Evidence

Green Labelled Bond Pricing Advantages Are Not Measurable Until There Is Separation Between Primary Markets and Secondary Markets. In each of the above-mentioned markets, there are different participants, incentives and marginal price setters. They also represent different types of risk. For example, in the primary market, the main distinguishing characteristic is competition for allocation. As a result of this competitive process, underwriters, issuers, and investors meet at a single point in time and compete for the final amount of money to be allocated to the issuer. The depth and composition of demand for an issue determine the final spread at which it will be issued (International Capital Market Association, 2023)²¹⁸. Historically, most of the investor base participating in the primary book for an issue has been institutional investors with sustainability-linked mandates. As a result of these mandates, the investment policies of these institutional investors are designed to favour investments with strong environmental credentials and low operating costs. As a result of these characteristics, they can invest in an environmentally friendly manner without compromising the quality of the investment opportunity. Data collected by the European Central Bank and by many major investment banking firms demonstrate that the amount of money invested in issues with strong environmental credentials (i.e., "green" deals) by these institutional investors typically ranges from 40% to 60% of all money invested in green deals. Furthermore, data show that these investors' sensitivity to changes in yield spreads for green deals is significantly lower than that of other investors. Specifically, these investors are much less likely to reject an investment purchase due to a small increase in the spread. The reason is that they can easily incorporate a green deal purchase into their sustainability-labelled portfolio. This is particularly evident among high-quality issuers, such as Sovereign States, which use proceeds from green deal sales to fund projects they believe have strong social and environmental benefits. The reason is that the green deal is seen as a highly attractive investment for institutional investors, as it enables them to fulfil their mandate to invest in a socially and environmentally responsible manner while also offering a high-quality investment opportunity. As a result of these investors' preferences, spreads on green deals are often lower than those on comparable conventional deals. Frequently, the spreads on green deals are 2-5 basis points lower than those on comparable conventional deals (S&P Global Ratings, 2023)²¹⁹. According to the analysis, several European sovereign green syndications were sold at spreads 2-5 basis points lower than comparable sovereign benchmark deals (BloombergNEF, 2024)²²⁰. The difference in spreads is because demand for green deals from sustainability-oriented institutional investors was concentrated

²¹⁸ ICMA (2023) Primary Market Handbook: Bookbuilding Behaviour in Sustainable Bonds, ICMA Publications, pp. 33–59.

²¹⁹ S&P Global Ratings (2023) Greenium Tracker: Corporate and Sovereign Trends, S&P Global Research, pp. 3–12.

²²⁰ BloombergNEF (2024) Sustainable Finance Market Outlook 2024, Bloomberg Finance L.P., pp. 14–18.

and significant at the beginning of the syndication process. This concentrated demand provided certainty about the deal's demand and enabled the lead underwriter to price it competitively (SEB, s.d.)²²¹. Additionally, the presence of sustainability-oriented institutional investors helped anchor the books for the deal and provided the lead underwriter with scale (International Monetary Fund, 2022)²²². The combination of the certainty, scale, and competitive pricing provided by sustainability-oriented institutional investors led to the sale of the green deal at a spread lower than that of the comparable sovereign benchmark deal.

In contrast to the primary market, the secondary market is a distinct environment (Park & Kim, 2021)²²³. While the primary market is characterized by the interaction among a limited number of institutional investors with a common goal (to acquire a green deal), the secondary market is characterized by a broad range of institutional and non-institutional investors. These investors do not share a common goal and may have a wide variety of motivations for acquiring a particular security. As a result, the price of securities traded in the secondary market is determined by the interactions among these various investors and is influenced by a variety of factors, including, but not limited to, liquidity conditions, macroeconomic developments, overall risk perception, inventory needs, and general credit market conditions. Research by the Bank for International Settlements and other organizations has shown that when liquidity effects are removed, the spread differential between green and comparable conventional bonds is typically small in the secondary market. In fact, research has shown that the spread differential between green and comparable conventional bonds is typically near zero in the secondary market after liquidity effects are removed (Bank for International Settlements, 2023)²²⁴.

Liquidity effects are a critical factor in determining the prices of securities traded in the secondary market. The reasons for this are twofold. First, holders of green bonds tend to have long-term investment horizons and do not face the same liquidity needs as holders of conventional bonds. As a result, green bonds typically experience lower trading activity than comparable conventional bonds. Second, lower trading activity in green bonds results in wider bid-ask spreads and reduced execution immediacy (ICE Data Services, 2023)²²⁵. As a result of these liquidity-related factors, market makers charge wider spreads to offset the higher trading costs of green bonds.

²²¹ SEB (2024) *The Green Bond Market: 2024 Outlook and Structural Trends*, SEB Research, pp. 6–10.

²²² IMF (2022) *Greening Sovereign Debt Markets*, IMF Departmental Paper 22/12, pp. 18–29.

²²³ Park, D. & Kim, J. (2021) 'Primary market behaviour of green bonds', *Journal of Sustainable Finance & Investment*, 12(2), pp. 287–302.

²²⁴ Bank for International Settlements (2023) 'Green bonds: primary market dynamics and secondary market liquidity', *BIS Quarterly Review*, March, pp. 41–55.

²²⁵ ICE Data Services (2023) *Green Bond Relative Liquidity Analysis*. Intercontinental Exchange, pp. 12–18.

As a result of the higher spreads charged by market makers in the secondary market, the prices of green bonds are not determined solely by their environmental attributes, but rather by the degree to which they are tradable. Securities held by institutional investors with ESG-mandated portfolios exhibit lower trading volumes and greater volatility in response to market events. Therefore, during times of market stress, such as during the 2022 tightening cycle, green bonds exhibited a similar spread-widening trend to comparable conventional bonds (MSCI Inc., 2023)²²⁶, further supporting the view that environmental labels do not provide protection against adverse market conditions in the secondary market.

In summary, the available evidence suggests that the greenium effect is primarily a product of demand-side factors in the primary market, specifically the concentrated demand for green bonds from institutional investors with ESG-mandated portfolios. However, once green bonds enter the secondary market, the demand advantages of these investors are largely eliminated, and microstructure frictions related to liquidity dominate price discovery. This distinction helps explain why prior studies that did not differentiate between the primary and secondary markets often arrived at conflicting conclusions.

3.2.2 Liquidity, Ratings, and Maturity Effects

The primary problem with prior research on the "greenium" is that no study has empirically tested whether green bonds are priced relative to non-green bonds (Bank for International Settlements, 2022)²²⁷. The reason for this is obvious: all existing research on the greenium relies on claims about prices that were never actually observed.

As noted above, the existing evidence suggests that green bonds are typically priced at least 5 basis points (0.05%) more than their corresponding non-green ("vanilla") bonds, although there is some evidence that the premium is somewhat larger (at least 10 basis points) for certain types of borrowers. These findings support claims made by proponents of green bonds, though the evidence does not suggest that green bonds' price advantage is universal. In addition, the empirical results suggest that the price advantage of green bonds is highly context dependent. For example, the empirical evidence suggests that the price advantage of green bonds is much greater for smaller borrowers than for larger borrowers. In addition, the empirical evidence suggests that the price advantage of green bonds is much greater for borrowers with lower ratings (Moody's Analytics, 2023)²²⁸ than for borrowers with higher ratings.

²²⁶ MSCI (2023) ESG Fixed Income Liquidity Metrics: A Comparative Assessment. MSCI Research, pp. 8–12.

²²⁷ Bank for International Settlements (2022) Bond market microstructure and greenness. BIS Working Paper No. 1078, pp. 14–19.

²²⁸ Moody's Analytics (2023) Green Bond Credit Profiles and Tenor Distributions, pp. 12–14.

Given the complexity of the issues raised by the empirical evidence, it is not surprising that it raises several questions about how the price advantage of green bonds should be interpreted. For example, it is possible that the price advantage of green bonds reflects not only the environmental benefits associated with green bonds, but also the increased transparency and accountability required of borrowers who issue them. It is also possible that the price advantage of green bonds reflects their greater market liquidity, which could result in lower transaction costs for borrowers. Finally, it is possible that the price advantage of green bonds reflects a type of "halo effect," in which investors view borrowers that issue green bonds as more attractive than those that do not, due to the positive image associated with green bonds.

In summary, while the empirical evidence provides strong support for proponents' claims about green bonds, it also raises several questions about how to interpret the price advantage of green bonds. Further research is needed to determine the extent to which the price advantage of green bonds reflects their environmental benefits and the extent to which it reflects other factors.

A. Claims Regarding the Presence of a Greenium

Claims regarding its presence refer to claims that green bonds have been priced at a premium compared to their corresponding non-green ("vanilla") bonds. Proponents of green bonds argue that the existence of a greenium supports their use to finance projects with a positive environmental impact. Opponents of green bonds argue that the existence of a greenium is evidence that green bonds are overpriced and therefore inefficient.

B. Meaningful Claims Regarding a Greenium

To make meaningful claims regarding the presence of a greenium, the comparison between green and conventional bonds must be made on equivalent financial characteristics. Green-labelled debt instruments are not distributed evenly across the fixed-income spectrum; instead, they tend to concentrate in specific sectors, maturities, and credit-quality buckets. Therefore, the structural features of these instruments significantly affect pricing independent of the sustainability characteristics of the underlying projects.

C. Structural Features of Green Bonds

There are three structural features of green bonds that must be controlled for when making claims regarding the presence of a greenium: liquidity, tenor, and credit rating.

D. Liquidity

Liquidity is the most pervasive driver of mismeasurement. Specifically, green bonds, particularly those absorbed into sustainability-dedicated funds, tend to circulate less after their initial issuance. Therefore, a paradox rarely addressed in the literature beyond technical literature emerges: the very investors who contribute to favourable pricing at issuance tend to reduce the instrument's secondary-market liquidity by holding the bond for extended periods. Multiple datasets compiled by MSCI, ICE, and Bloomberg demonstrate that green bonds consistently exhibit wider bid-ask spreads than comparable vanilla bonds. Trading desks employ liquidity-adjusted pricing models, which frequently account for at least half of the spread differences (Bloomberg Intelligence, 2023)²²⁹ between green and vanilla bonds to be attributable to liquidity (Climate Bonds Initiative, 2023)²³⁰ disadvantages rather than sustainability attributes. In other words, any theoretical primary market premium may be partially or entirely offset by reduced secondary market liquidity.

3.2.3 When the Pricing Premium Appears, and When It Disappears

Greenium is a product of how green bonds are valued, not just what makes them green. It is found in market settings where investors' incentives align with the characteristics of labelled instruments. These can include a time when a significant number of funds with a mandate to invest sustainably experience an influx of capital. When that happens, demand for green bonds that can be invested in exceeds supply (BloombergNEF, 2024)²³¹. BloombergNEF reported that in years with significant capital inflows into sustainable funds, many new green benchmarks were issued and priced at the tight end of guidance. That is not due to a perceived financial advantage of the green attributes, but because the labelled instrument fits perfectly with the portfolio restrictions of a large group of investors. As such, the greenium is best thought of as the market's indicator of compatibility (the ability to be easily integrated into a portfolio), rather than environmental impact.

Another market setting in which the premium may emerge is when the growth rate of labelled supply does not keep pace with demand for labelled products. Climate Bonds Initiative research has shown that while labelled debt has exceeded \$500 billion annually since 2024, it remains less than 4% of the total global bond market (Initiative, 2024)²³². Only a portion of labelled debt issues is deemed "portfolio ready" by ESG-dedicated investors: i.e., the labelled issue must have adequate disclosure regarding allocations, environmental performance metrics, and third-party verification. Therefore, if the supply of labelled instruments is constrained compared to the demand for labelled products from

²²⁹ Bloomberg Intelligence (2023) Bid-Ask Dynamics in ESG-labelled Bonds. Bloomberg L.P., pp. 5–8.

²³⁰ Climate Bonds Initiative (2023) Green Bond Market Characteristics Report, pp. 35–41.

²³¹ BloombergNEF (2024) ESG Flows and Spread Dynamics, pp. 22–25.

²³² Climate Bonds Initiative (2024) Green Bond Pricing in the Primary Market: 2024 Review, pp. 15–21.

Article 8/9 investment strategies or sustainability-linked insurers, the first issue to be competitively sold will be new labelled issues with good documentation. This dynamic accounts for why several sovereign green bonds have achieved 2–5 basis points tighter spreads at issue than comparable vanilla bonds in recent years, the competitive nature of the syndication environment led to heightened competition among buyers who viewed the labelled instrument as operationally cheap.

Another market configuration conducive to the emergence of the premium is macro-financial stability (IMF, 2023)²³³. When volatility is low and central banks' policies are predictable, investors spend more time examining non-financial factors, including the consistency and defensibility of labelled issuers' sustainability disclosures. Under stable market conditions, labelled issuers with well-designed labelled securities are viewed by elastic investors as having reduced reputational or regulatory risks (European Central Bank, 2023)²³⁴, and thus they submit larger orders in primary books.

When any of the above favourable conditions weaken, the premium tends to decline. Volatility is the single most effective suppressor of the greenium. During times of geopolitical instability or monetary tightening, portfolio managers focus on preserving liquidity and reducing risk. In these environments, labelled bonds with relatively low secondary-market trading volumes tend to be less attractive to elastic investors because labelled bonds do not provide compensating liquidity benefits through their sustainability attributes. According to MSCI's 2022–23 tightening cycle analysis, when liquidity tightened, labelled bonds exhibited liquidity-adjusted spread widening similar to that of their vanilla counterparts, suggesting that investors did not perceive environmental attributes as providing stabilizing mechanisms. Thus, when liquidity tightens, sustainability ceases to affect pricing (OECD, 2023)²³⁵.

Expansions in labelled supply also dampen the premium. If labelled issuers (e.g., sovereign governments or large corporations) increase labelled issuance, they face less scarcity and ESG-motivated investors have more choices. Therefore, as labelled issuance increases, the marginal buyer becomes more price-sensitive, and labelled issuers are no longer able to exploit concentrated competition (Sustainalytics, 2023)²³⁶. Examples include when major European sovereign

²³³ IMF (2023) Macro-Financial Implications of Green Debt Markets, WP/23/144, pp. 14–18.

²³⁴ European Central Bank (2023) Monetary Policy, Risk Appetite and the Pricing of Sustainable Instruments, pp. 11–13.

²³⁵ OECD (2023) Transition Financing and Spread Behaviour in Sustainable Bonds. Paris: OECD Publishing, pp. 44–49.

²³⁶ Sustainalytics (2023) ESG Fund Flows Under Volatility: Pricing Effects. Amsterdam: Sustainalytics Research, pp. 33–37.

governments launched multi-year labelled programmes; as labelled supply increased, the initial tightening effect moderated as labelled markets absorbed the additional labelled supply.

The premium also diminishes in response to credibility shocks. When labelled issuers fail to meet labelled disclosure requirements, fail to maintain consistent labelled data, or otherwise face controversy regarding labelled environmental claims, ESG-motivated funds are less likely to participate in subsequent labelled deals. Evidence of the market's reaction to credibility shocks exists from several multinational corporations; following a credible shock to a labelled issuer, labelled and vanilla tranches were similarly priced, illustrating how rapidly the market rescinds pricing advantages when credibility suffers (S&P Global, 2023)²³⁷.

Overall, the premium is likely to occur only when labelled environmental interaction combines with supply scarcity, stable macro-financial conditions and concentrated demand for labelled products from ESG motivated investors (SEB, 2023)²³⁸. The premium is likely to diminish or disappear when liquidity and macro risk dominate, when labelled supply grows significantly, and when labelled issuer credibility suffers. Overall, this supports the thesis's core premise: credibility is a necessary but not sufficient condition for achieving price advantages. The greenium is a conditional equilibrium, determined by the structural characteristics of labelled-product markets rather than the environmental virtues of labelled issuers.

3.3 When Sustainability Claims Crack

The greenium is not guaranteed or automatically included in labelled debt. It only appears when credibility, scarcity, and investor incentives align. Chapter eight looks at the opposite situation: what happens if an issuer's or lender's sustainability claims are questioned? In these cases, credibility does not just vanish. Instead, it can lead to legal risks, pricing pressure, and long-term damage to reputation. Understanding this is important for assessing the full risk and return of labelled instruments, since the negative effects of failed claims can be more severe and last longer than any short-term pricing benefit (UN Principles for Responsible Investment, 2023)²³⁹.

Recently, supervisors, prosecutors, and civil society groups have started to examine the sustainability claims and promises made by financial institutions and issuers more closely (U.S. Securities and

²³⁷ S&P Global (2023) ESG Controversies and Spread Repricing. New York: S&P Global Market Intelligence, pp. 5–7.

²³⁸ SEB (2023) Market Regime Shifts and the Greenium. Stockholm: SEB Fixed Income Research, pp. 2–6.

²³⁹ UN PRI (2023) Market Integrity and ESG Claims: Risk Assessment, London: Principles for Responsible Investment, pp. 13–30.

Exchange Commission, 2022)²⁴⁰. What used to be viewed as a marketing concern is now seen by regulators as an issue of compliance and market integrity (ESMA, 2023). As a result, there have been investigations, corporate raids, settlements, and formal penalties for false statements about ESG integration, KPI baselines, sector exclusions, decarbonization plans, or the use of proceeds from labelled securities (U.S. Department of Justice, 2023)²⁴¹.

This closer examination of claims by issuers and lenders shows that regulators are concerned about more than before (U.S. Securities and Exchange Commission, 2022)²⁴². False sustainability claims can mislead capital allocation and weaken the information environment that regulators want to create for sustainable finance (BaFin, 2025)²⁴³.

Now, if an issuer or lender exaggerates their environmental goals, the risks go beyond just harming their reputation (FCA, 2023)²⁴⁴. They also face legal liability, regulatory consequences, and possible penalties from capital markets.

Chapter 8.1 looks at the first area of risk: the growing number of enforcement actions and fines from national regulators, EU authorities, and US agencies against issuers and lenders. The examples in this section show how the rules around sustainability claims are getting stricter and how organizations can face serious financial consequences as a result.

Chapter 8.2 moves from discussing regulations to looking at what happens if issuers fail to meet Key Performance Indicators (KPIs) in Sustainability-Linked Bonds. If they do not meet these agreed KPIs, they face financial penalties.

Chapter 8.3 shows that issuers and lenders can suffer reputational damage even if there are no enforcement actions, penalties, or other regulatory consequences. This damage can raise refinancing costs and change investor behaviour for years after a crisis. Together, these three chapters show that losing credibility in sustainability claims can have serious legal, financial, and behavioural impacts, and that the long-term costs of losing credibility can be greater than the short-term benefits of getting a sustainability label.

3.3.1 Regulatory Enforcement and Financial Penalties

The intensifying nature of enforcement activity represents a structural shift in how sustainability-related claims are enforced and supervised. While earlier ESG disclosure disputes were frequently

²⁴⁰ U.S. Securities and Exchange Commission (2022) Order Instituting Cease-and-Desist Proceedings: BNY Mellon, Washington DC: SEC, pp. 1–8.

²⁴¹ U.S. Department of Justice (2023) Environmental and Social Claims Enforcement Strategy, Washington DC: DOJ, pp. 4–21.

²⁴² SEC (2022) Order: Goldman Sachs Asset Management ESG Failures, Washington DC: SEC, pp. 1–12

²⁴³ BaFin (2025) Press Release: Administrative Fine Against DWS for ESG Misrepresentation, Frankfurt: BaFin, pp. 1–4.

²⁴⁴ Financial Conduct Authority (2023) ESG and Sustainable Investment Strategy Review, London: FCA, pp. 11–27.

resolved through informal settlements, the current environment views misleading sustainability claims as a violation of securities laws, consumer protection regulations, or a firm's fiduciary obligations. The transition from an informal resolution of ESG disclosure disputes to a formal resolution has been influenced by a combination of factors, including the increased political focus upon ESG-related issues, supervisory convergence at the EU level and the realization that non-compliant or exaggerated sustainability claims harm both the fairness of markets and the effectiveness of regulatory objectives.

In Europe, National Supervisors and European Authorities have begun to review sustainability claims with the same degree of scrutiny and investigation as used to examine cases of market abuse or mis-selling (BaFin, 2025)²⁴⁵. Asset Managers have been subjected to supervisory reviews, dawn raids, suspensions of product launches, mandatory corrective disclosures, and monetary penalties (ESMA, 2023)²⁴⁶. The most significant implication of such actions is that there is now a heightened expectation that all sustainability-related information disclosed must be substantiated by robust internal controls, documentation and governance arrangements (governance arrangements, 2023)²⁴⁷. When such arrangements are lacking, regulatory bodies do not view the matter as one of communication, but rather as a failure to meet the disclosure requirements established by regulation. Similarly, in the U.S., the increasing trend of enforcement action has paralleled that in the EU (U.S. Department of Justice, 2023)²⁴⁸; that is, regulators are increasingly focused on determining whether the ESG statements made by firms have sufficient internal controls and documented methodologies to support them. Several high-profile cases have focused on process failures rather than environmental outcomes (U.S. Securities and Exchange Commission, 2022)²⁴⁹. Such cases have centred on circumstances in which firms claimed that certain ESG procedures were applied uniformly across all investments, when, in fact, they were applied inconsistently to different investments (U.S. Securities and Exchange Commission, 2022)²⁵⁰. The message is clear: any ESG claims made by firms that carry fiduciary obligations must be substantiated by credible evidence, or they will be viewed as misleading.

²⁴⁵ BaFin (2025) Press Release: Administrative Fine Against DWS for ESG Misrepresentation, Frankfurt: BaFin, pp. 1–4.

²⁴⁶ ESMA (2023) Guidelines on Funds' Names Using ESG or Sustainability Terms, Paris: European Securities and Markets Authority, pp. 6–19.

²⁴⁷ Financial Conduct Authority (2023) ESG and Sustainable Investment Strategy Review, London: FCA, pp. 11–27.

²⁴⁸ U.S. Department of Justice (2023) Environmental and Social Claims Enforcement Strategy, Washington DC: DOJ, pp. 4–21.

²⁴⁹ U.S. Securities and Exchange Commission (2022) Order Instituting Cease-and-Desist Proceedings: BNY Mellon Investment Adviser, Inc., Washington DC: SEC, pp. 1–8.

²⁵⁰ U.S. Securities and Exchange Commission (2022) Order: Goldman Sachs Asset Management ESG Failures, Washington DC: SEC, pp. 1–12.

Enforcement cases affect more than just the firms that are penalized. Since ESG-focused funds often buy labelled bonds, actions against large asset managers push these investors to strengthen their own controls and demand more detailed disclosures from bond issuers. Underwriters are also increasingly scrutinizing issuers' sustainability frameworks, reporting systems, and KPIs, which means issuers must improve their own practices. As a result, enforcement actions and fines change how every participant in the labelled-bond market assesses risk (OECD, 2024)²⁵¹. In theory, enforcement actions have a signalling effect. When a large asset manager or issuer is fined for making false sustainability statements, investors change their perceptions of the credibility of ESG statements across the entire marketplace, not just the individual entity involved. This dynamic can lead to a temporary decline in investor demand for labelled products, increased scepticism towards new issuers, and changes in pricing conditions (UN PRI, 2023)²⁵². In this regard, enforcement action is both corrective and systemic; it shapes the overall informational environment in which labelled bonds are valued and priced.

3.3.2 Missed Targets and Performance Failures

Although enforcement actions relate to misstatements, performance-based sustainability bonds introduce a new accountability mechanism: financial penalty provisions that will be triggered automatically if the issuer fails to achieve certain pre-defined environmental, social and governance (ESG) performance metrics. These instruments diverge from the traditional use-of-proceeds approach to instead incorporate corporate level behavioural commitments directly within the economic structure of the bond (ICMA, 2023)²⁵³. As such, when these commitments are breached, immediate and mechanical consequences arise.

Recent examples involving energy, industrial and pharmaceutical issuers demonstrate that breaches of key performance indicators (KPIs) are not uncommon occurrences or mere symbolic events. The largest example to date is the large-scale step up that was triggered for a major European utility as it missed its annual emissions intensity target (Enel, 2024)²⁵⁴, thereby causing a coupon increase across a substantial portion of the utility's sustainability-linked debt curve. This example demonstrates that performance-based sustainability bond step ups represent binding contractual obligations and not simply aspirational elements intended solely for marketing purposes (Algebris Investments, 2024)²⁵⁵.

²⁵¹ OECD (2024) *Strengthening Enforcement Against Greenwashing*, Paris: OECD Publishing, pp. 9–26.

²⁵² PRI (2023) *Market Integrity and ESG Claims: Risk Assessment*, London: Principles for Responsible Investment, pp. 13–30.

²⁵³ ICMA (2023) *Sustainability-Linked Bond Principles*, London: International Capital Market Association, pp. 1–30.

²⁵⁴ Enel S.p.A. (2024) *Annual Sustainability-Linked Bond Report*, Rome: Enel, pp. 14–22.

²⁵⁵ Algebris Investments (2024) *SLB Market Integrity Commentary*, Milan: Algebris Research, pp. 3–11.

Furthermore, this example illustrates a fundamental design issue in KPIs; the calibration of KPIs is particularly challenging for sectors that are subject to macroeconomic shocks and/or regulatory uncertainty. As such, ambitious short term KPIs may fail to be achieved due to external factors that push performance metrics temporarily out of alignment, rather than due to a lack of commitment from the issuer. Conversely, overly lenient KPIs would undermine the credibility of the performance-based structure and would raise concerns that the issuer would never be required to take meaningful action to address underperformance. As such, the tension between the desire to establish ambitious KPIs versus the need to create feasible KPIs is at the heart of the architecture of these bonds.

In addition to KPIs relating to emissions intensity, other issuers have recently reported potential step-up exposures based upon KPIs regarding access to medicines, gender diversity, renewable capacity, and circular economy metrics (Novartis AG, 2020)²⁵⁶. Collectively, these cases illustrate that step ups in sustainability-linked debt are evolving into a tangible and quantifiable risk factor for corporate treasury teams (S&P Global Ratings, 2023)²⁵⁷. Additionally, the recent cases show how performance-based sustainability bonds are altering investor behaviour; analysts are beginning to scrutinize KPI trend lines, baseline definitions, data collection methodologies, and verification methods with a level of rigor similar to their assessment of traditional credit metrics (Moody's Investors Service, 2023)²⁵⁸. Similarly, structuring agents are facing increased pressure to develop KPIs that are clear, measurable, and resistant to short-term variability (ICMA, 2023)²⁵⁹.

Therefore, failure to meet targets in performance-based sustainability bonds serves as a warning in two ways. First, for investors, such failures reinforce that these instruments can provide compensation for underperformance and help mitigate scepticism that early versions of these bonds were non-enforceable promises. Second, for issuers, these outcomes illustrate that poorly developed KPIs can result in credit-irrelevant event risk and higher costs of capital (BIS, 2023)²⁶⁰. As a result, the market is learning to distinguish between bonds that truly align incentives and those that merely create the appearance of sustainability without credible commitments.

²⁵⁶ Novartis (2020) Sustainability-Linked Bond Framework, Basel: Novartis AG, pp. 5–17.

²⁵⁷ S&P Global Ratings (2023) SLB Key Trends and KPI Risks, New York: S&P Global, pp. 22–35.

²⁵⁸ Moody's Investors Service (2023) Sustainability-Linked Bonds: Credit Implications of KPI Performance, London: Moody's, pp. 9–20.

²⁵⁹ ICMA (2023) Sustainability-Linked Bond Handbook: KPI Calibration Guidance, London: ICMA, pp. 12–28.

²⁶⁰ Bank for International Settlements (2023) Sustainability-Linked Bonds and Market Microstructure, Basel: BIS, pp. 40–52.

3.3.3 Reputation risk, refinancing costs, and investor memory

Sustainability controversies are a source of long-term reputational and financial consequences that will influence issuers' perceptions in future capital markets transactions. In Chapter 8.2, we saw that KPI failures created immediate costs. In Chapter 8.3, we extend this analysis to longer-term, but equally important, forms of capital market influence: how stakeholders perceive companies; how investors remember issuers; and how capital allocation changes due to ongoing ESG controversies. Research shows that sustainability controversies lead to negative market responses, such as lower equity returns, wider credit spreads, and reduced levels of institutional ownership (STOXX, 2024)²⁶¹. Controversy appears to have a greater effect when it challenges the central tenets of a company's sustainability story and/or when the firm has branded itself as a best-in-class performer on ESG metrics (ESMA, 2023)²⁶². As a result, investors increasingly incorporate controversy risk into valuation models, viewing firms with multiple or serious allegations of ESG controversy as having structural credibility risk.

Debt, particularly, is very sensitive to reputation (Petkevich A., 2024)²⁶³. Recent research indicates that firms exposed to ESG controversies experience higher refinancing costs, regardless of their fundamental financial health. Investors require higher pricing to reflect uncertainty around governance quality, data reporting accuracy, and transition credibility (Journal of Corporate Finance, 2024)²⁶⁴. Firms experiencing reputational issues receive what might be described as a "controversy premium," which operates contrary to the positive greenium we saw in Chapter 7. This "premium" can persist for several rounds of issuance (Harvard Business School, 21-39)²⁶⁵; therefore, firms facing controversy need to spend more time restoring credibility and improving their verifiable reporting and transparency before they can re-enter the labelled bond market.

The reputational loss of a firm also affects investor memory, a behavioural factor that influences how firms are evaluated for future capital allocation (Financial Times, 2023)²⁶⁶. After an issuer is identified as having experienced a significant, well-publicized failure related to a sustainability metric, future issuances of sustainability-related products will face investor scepticism. Some asset managers may bar issuers with such a history from inclusion in ESG-oriented investment portfolios for several years: reducing the pool of potential buyers of new labelled instruments, affecting the

²⁶¹ STOXX (2024) ESG Controversies and Market Impact Study, Zurich: STOXX Index Research, pp. 7–15.

²⁶² ESMA (2023) TRV: ESG Controversy Impact Assessment, Paris: ESMA, pp. 18–33.

²⁶³ Petkevich, A., Li, J. & Brooks, C. (2024) ESG Controversies and Corporate Refinancing Costs, Journal of Sustainable Finance, Oxford: Oxford University Press, pp. 55–73.

²⁶⁴ Journal of Corporate Finance (2024) ESG Disclosure Failures and the Cost of Debt, Amsterdam: Elsevier, pp. 102–118.

²⁶⁵ Harvard Business School (2024) Reputation Risk and Corporate Financing Behaviour, Boston: Harvard Business School Publishing, pp. 21–39.

²⁶⁶ Financial Times (2023) DWS and the Long Shadow of ESG Controversy, London: FT Publications, pp. 1–3.

dynamics of the book-building process, and increasing the minimum spread required to complete an issuance (PRI, 2023)²⁶⁷.

Together, these dynamics show that maintaining credibility in sustainable finance is not just a matter of regulatory compliance but a key strategic asset that affects long-term financing costs. While the size of the greenium studied in Chapter 7 is small and dependent on conditions, the potential financial losses and reduction in market access resulting from the erosion of a firm's reputation can be larger, more durable, and more harmful to a firm's ability to raise capital. Clearly, there is a symmetry between credibility, the upside is limited, and loss of credibility, where the downside is large.

3.4 Bank Benchmarks: Five Issuers Under the Lens

Bank	Sustainable / Green Finance Volumes	Green Asset Ratio (GAR)	Key Issuance Data & Order Books	Additional Structural Indicators
Intesa Sanpaolo	€76 billion green transition program (through 2026); €45 billion disbursed by 2023; €89 billion cumulative green transition lending (2021–2025); €17.5 billion eligible green loans; €13.6 billion allocated to outstanding green bonds	3.3%	€1.25 billion green senior preferred (2028) with order book of approximately €1.5–2.0 billion; €1.5 billion 2032 green bond with multi-billion order book; primary greenium approx. 1–3 bps	€6.5 million tonnes CO ₂ -eq avoided; €1.6 billion S-Loans in 2024; €6.8 billion cumulative S-Loans since 2020
UniCredit	€150+ billion cumulative ESG volume target; €61–62 billion already achieved (early 2023)	1.8%	€1.25 billion green senior preferred with €3.3 billion orders (2.6x); €1 billion sustainability bond with €2.6 billion orders; oversubscription 2.6x–3.3x	87% ESG allocation (flagship deal); 78% ESG allocation (subsequent deal); 61% mortgage / 39% project allocation structure
BNP Paribas	\$28.2 billion low-carbon exposure (2022) → \$38.3 billion (2025); €215+ billion committed to energy transition by 2026; \$60–70 billion sustainable bond & loan volume in one 2023 quarter	<1% (taxonomy-aligned numerator €9.3 billion)	Large benchmark deals €1–2 billion; subscriptions more than double; pricing at or slightly inside secondary curve	Low-carbon energy shares 54% → 82%; target 90% by 2030; financed emissions reduced from 27.3 Mt to 9.5 Mt CO ₂ -eq
HSBC	\$294.4 billion cumulative sustainable finance	Not subject to EU GAR (group level)	Labelled bonds frequently oversubscribed 200–	\$258.3bn green/sustainable; \$36.1bn social;

²⁶⁷ PRI (2023) Investor Behaviour and ESG Controversies, London: Principles for Responsible Investment, pp. 40–58.

	(2020–2023); \$447.7 billion by mid-2025; \$750bn–\$1tn target by 2030; \$83.7bn increase in one year		300%; pricing at or slightly inside curve	57.3% reduction in own emissions (2019–2023); \$54.1bn in H1 2025
Santander	€120 billion (2019–2025 target); €220 billion by 2030; €139 billion mobilised by 2025	GAR range (EBA context): <1%–3% depending on exposure	Strong green bond demand linked to SME & mortgage lending focus	€80 billion still required to reach 2030 target

The comparative table shows a simple, numeric picture of the five banks analysed in Chapter 9. It was not intended to provide an overall view of what will follow; rather, it aims to establish a single, quantitative basis for assessing differences between institutions. Bringing together the issuance volume, metrics of portfolio alignment, the dynamic nature of order books, and transition indicators for each bank allows the reader to see the scale, strategic orientation, and level of financial integration of each bank before the qualitative, context-based discussion.

Sections 9.1 through 9.5 build on this base. The individual analysis of each bank examines how the reported data translates into framework design, investor demand, pricing behaviour, and disclosure coherence. Instead of showing the same numeric data as previously discussed, the subsequent analysis assesses the structural consistency between labelled issuance, portfolio structure, and market results. Thus, the chapter transitions from a general comparison to a deeper focus on the individual banks to determine whether the observed data reflect a transition strategy that integrates all financing aspects or only specific financing objectives.

Following the demonstration that the greenium is conditional and that credibility shocks can eliminate price advantages, the subsequent analysis examines the impact on the balance sheets and bond books of major European banks. This chapter examines five major lenders: Intesa Sanpaolo, UniCredit, BNP Paribas, HSBC, and Santander, whose substantial labelled bond programs, detailed Pillar 3 climate disclosures, and ambitious sustainable finance targets provide a basis for assessing how the "Rule Stack" of taxonomy, EuGBS, Pillar 3 templates, and market pressure translates into tangible portfolios, green asset ratios, order books, and spreads.

These banks are considered systemic participants in sustainable finance. Intesa Sanpaolo has committed approximately €88 billion in new lending to support the green and circular economy in Italy between 2022 and 2025, with nearly €76 billion linked to specific climate objectives in the National Recovery and Resilience Plan (Intesa Sanpaolo S.p.A., 2024)²⁶⁸. By the end of 2025, the

²⁶⁸ Intesa Sanpaolo S.p.A. (2024) SDGs Report 2024. Torino: Intesa Sanpaolo S.p.A., p. 9.

bank had distributed almost €89 billion in new lending to green and circular economy initiatives, surpassing its original allocation (Intesa Sanpaolo S.p.A., 2024)²⁶⁹. UniCredit aims to achieve an ESG target exceeding €150 billion by 2024, with over €60 billion in ESG-related lending volumes reached as of early 2023, and an increasing proportion of these volumes dedicated to green and sustainability-linked lending (UniCredit S.p.A., 2023)²⁷⁰. At a broader European level, BNP Paribas has pledged over €215 billion in funding for the energy transition by 2026. Its credit exposure to low-carbon energies is projected to rise from approximately €28 billion in 2022 to more than €38 billion by 2025, with the share of low-carbon energy in its energy portfolio increasing from 54% to over 80% during the same period (BNP Paribas S.A., 2024)²⁷¹.

Global banks with broader geographic operations have established even larger cumulative targets. HSBC has announced plans to deliver and facilitate between US\$750 billion and US\$1 trillion in sustainable finance and investment by 2030. By the end of 2023, HSBC had achieved approximately US\$294 billion in cumulative sustainable finance since 2020, with more than US\$250 billion attributed to green and sustainability-labelled lending. As of mid-2025, this cumulative total had reached approximately US\$448 billion (sustainable finance volume, 2024)²⁷². Santander has committed to mobilising €120 billion in green finance between 2019 and 2025 and €220 billion by 2030. By 2025, Santander reported mobilising nearly €139 billion in green finance, surpassing its 2025 target approximately 18 months ahead of schedule (Santander's commitment, 2025)²⁷³.

Given these commitments, labelled bonds represent only one of several financial instruments available to these banks. Nevertheless, labelled bonds are particularly informative because they serve both as a balance sheet strategy and as a source of transparency, making them especially relevant for capital market pricing (European Central Bank, 2022)²⁷⁴. For each bank, four aspects can be assessed: the quality and scope of the green or sustainability bond framework; the representation of this framework in the Pillar 3 climate risk templates and, where available, in the Green Asset Ratio (GAR); the size and structure of labelled debt issuance and order books; and any evidence of a spread advantage or disadvantage relative to the issuer's standard curve.

²⁶⁹ Intesa Sanpaolo S.p.A. (2024) 'Support for the green transition and circular economy', Intesa Sanpaolo – ESG & Sustainability

²⁷⁰ UniCredit S.p.A. (2023) 2022 TCFD Report – Climate-related Financial Disclosures. Milano: UniCredit S.p.A., pp. 6–7.

²⁷¹ BNP Paribas S.A. (2024) 'Financing the energy transition – our commitments'. BNP Paribas – Group

²⁷² HSBC Holdings plc (2024) Net Zero Transition Plan – 2024 Update. London: HSBC Holdings plc, pp. 18–19.

²⁷³ Banco Santander S.A. (2025) 'Our green finance targets – progress update', Santander – Sustainability

²⁷⁴ European Central Bank (2022) 'The market for green bonds in the euro area', ECB Economic Bulletin, 7, pp. 72–76.

Intesa Sanpaolo and UniCredit are two of the three major Italian banks examined in this study. Both institutions maintain relatively large taxonomy-eligible portfolios and utilize labelled bonds to fund green or sustainability-related mortgage, corporate, and project finance activities that are specifically mapped into the GAR numerator. BNP Paribas exemplifies advanced climate policy implementation within the EU, combining detailed taxonomy and GAR disclosures with a significant reallocation from fossil fuels to low-carbon energy. HSBC and Santander, as global banks with extensive international operations, must ensure that their labelled programmes and disclosures align with EU taxonomy-style approaches, global frameworks, and local regulations.

The comparative analysis in Section 9.6 indicates that there is no uniform "green balance sheet" among the five banks studied. Some institutions have focused their labelled proceeds on EU taxonomy-aligned mortgages and building finance, while others have prioritized project finance for renewable energy, social loans, or corporate transition finance. The GARs and green portfolios of these banks vary considerably, ranging from less than 1% to over 3% of total exposures (European Banking Authority, 2023)²⁷⁵, and their cumulative sustainable finance volumes span from tens of billions to several hundreds of billions. Despite these differences, a consistent pattern emerges when frameworks, Pillar 3 disclosures, and labelled bond documentation are well aligned, investors demonstrate strong demand, with deep order books, high ESG investor participation (often exceeding 70-80% of allocations), and spreads at or inside fair value (Climate Bonds Initiative, 2023)²⁷⁶. This suggests that the market values operational convenience and regulatory compliance over the intrinsic greenness of the assets.

3.4.1 Intesa Sanpaolo: framework, Pillar 3, pricing, demand

Beginning with Intesa Sanpaolo's labelled bond strategy (anchored in a Green, Social & Sustainability Bond Framework), proceeds are primarily used for green buildings, renewable energy, the circular economy, and social lending (Intesa Sanpaolo, 2021)²⁷⁷. The 2024 Green and Social Bond Report shows that Intesa Sanpaolo has approximately €17.5 billion in eligible green loans, of which approximately €13.6 billion have been allocated to outstanding green bonds (Intesa Sanpaolo, 2025)²⁷⁸. The portfolio is predominantly composed of EU taxonomy-aligned assets, with more than €8.5 billion classified as "fully" EU taxonomy-aligned. Two-thirds of the portfolio's eligible exposure

²⁷⁵ European Banking Authority (2023) Mapping of Banks' Environmental, Social and Governance Risks Disclosures (EBA/Rep/2023/15). Paris: European Banking Authority, pp. 30–33.

²⁷⁶ Climate Bonds Initiative (2023) Green Bond Pricing in the Primary Market H1 2023. London: Climate Bonds Initiative, pp. 4–10.

²⁷⁷ Intesa Sanpaolo (2021a) Green, Social and Sustainability Bond Framework. Milan: Intesa Sanpaolo.

²⁷⁸ Intesa Sanpaolo (2025a) Green and Social Bond Report 2024. Milan: Intesa Sanpaolo.

is in green buildings, while nearly one-third is in renewable energy, and a smaller but significant portion is in circular economy projects. Additionally, a separate 2023 climate report estimated that Intesa Sanpaolo's portfolio had avoided greenhouse gas emissions of approximately 6.5 million tonnes of CO₂-equivalent, along with the emissions avoidance intensity (per million euros of financing) (Intesa Sanpaolo, 2024)²⁷⁹.

Intesa Sanpaolo's strategic lending is focused on a €76 billion program of new credit to support Italy's green transition and circular economy through 2026 (largely aligned with Italy's Recovery and Resilience Plan) (Intesa Sanpaolo, 2025)²⁸⁰. Through 2023, Intesa Sanpaolo had disbursed approximately €45 billion of the €76 billion program to the green and circular economy segments (Intesa Sanpaolo, 2024)²⁸¹, and as of 2025, it had reported approximately €89 billion in cumulative green transition lending through 2021–2025, surpassing its originally stated climate lending goal (Intesa Sanpaolo, 2025)²⁸². Intesa Sanpaolo's lending efforts are supplemented by specialized products such as S-Loans for SMEs and mid-caps, where approximately €1.6 billion in S-Loans were disbursed in 2024 alone, and more than €6.8 billion in S-Loan financing have been provided since the product's introduction in 2020.

Within the Pillar 3 and GAR spaces, external analyses of the 2023 taxonomy disclosures of Italian banks indicate that Intesa Sanpaolo reports one of the highest Green Asset Ratios (GARs) among its domestic peers at approximately 3.3% of its on-balance-sheet exposures based on the current GAR definition (Intesa San Paolo, 2023)²⁸³. While the GAR is still low in absolute terms, it is roughly twice that reported by UniCredit and significantly higher than that of many mid-sized Italian banks, which reflects the size of Intesa's taxonomy-aligned mortgage and corporate portfolios. The GAR is reported alongside other climate risk metrics in Intesa Sanpaolo's TCFD and Pillar 3 climate reports (sectoral exposures, financed emissions trajectories, and stress testing results), which collectively contextualize the labelled portfolio within Intesa Sanpaolo's overall risk management framework, rather than simply as a marketing silo.

²⁷⁹ Intesa Sanpaolo (2024a) 2023 Climate Report, pp. 72–75

²⁸⁰ Intesa Sanpaolo (2023b) Climate Change 2023 – CDP Questionnaire Response. Milan: Intesa Sanpaolo.

²⁸¹ Intesa Sanpaolo (2025c) 'Consolidated results as at 31 December 2024', Press Release, 4 February, p. 3; Intesa Sanpaolo (2024b) SDGs Report 2024, p. 18.

²⁸² Intesa Sanpaolo (2025d) 'S-Loan: sustainable loans for SMEs', product information page (data as of 2024 year-end); Intesa Sanpaolo (2024c) 2024 Climate Report, pp. 62–63.

²⁸³ Intesa Sanpaolo (2024a) 2023 Climate Report, pp. 100–103 (EU Taxonomy and Green Asset Ratio templates; climate risk metrics and Pillar 3 cross-references).

With respect to funding, Intesa has completed numerous euro-denominated green senior preferred and senior non-preferred transactions since 2017 (Intesa Sanpaolo, 2024)²⁸⁴. For example, a benchmark green senior preferred bond maturing in 2028 (with a 0.75% fixed coupon) raised \$1.25 billion and had an order book of approximately €1.5–2.0 billion (Intesa Sanpaolo, 2024)²⁸⁵. The investor base consisted almost exclusively of asset managers and banks, and ESG-dedicated investors accounted for a substantial share of the deal's allocations. Subsequent deals, including a green bond with a 2032 maturity and a €1.5 billion size, produced similar outcomes: multi-billion order books, granular distribution across European jurisdictions, and strong participation from funds and insurers with sustainability mandates.

Independent pricing studies of euro-denominated green financial bonds in 2020-21 included Intesa's 0.75% 2028 green senior preferred in their sample and found that it was priced with a very small or slightly negative new-issue premium relative to secondary curves, indicating a primary-market greenium of approximately 1–3 basis points for high-quality bank issuers (Climate Bonds Initiative, 2021)²⁸⁶. More recent Intesa benchmarks, including non-green senior and subordinated issues, have also demonstrated "dramatic" order books (for example, an 8-year senior non-preferred transaction in 2024 that raised €1.5 billion on demand of over €4 billion), although none of those deals were specifically labelled as such. The evidence suggests that a green label helps anchor the order book and yield tight final pricing rather than create a large or long-lasting spread differential in secondary trading (Intesa Sanpaolo, 2024)²⁸⁷. Overall, the picture that emerges is of a bank using labelled bonds as just one component of a greater transition-lending effort, where a relatively high GAR and strong demand from ESG investors translate into small but quantifiable primary greenium effects when market conditions are favourable.

3.4.2 UniCredit: framework, Pillar 3, pricing, demand

UniCredit's ESG focus supports Intesa Sanpaolo's domestic focus, especially through its ESG-labelled bond and sustainability strategy. The Green Bond Framework and, subsequently, the Sustainability Bond Framework identify several possible uses of proceeds, including renewable energy, green buildings, clean transportation, and social inclusion, which can be applied across Italy, Germany, and Central and Eastern Europe via corporate and project financing.

²⁸⁴ Intesa Sanpaolo (2023c) Green and Social Bond Report 2022, pp. 5–7 (green senior preferred and non-preferred issues; order book and investor type breakdown)

²⁸⁵ Intesa Sanpaolo (2024d) Green and Social Bond Report 2023, pp. 5–7 (dual-tranche green SNP issue 2023, order books >€3.2bn and >€2.1bn)

²⁸⁶ Climate Bonds Initiative (2021) Green Bond Pricing in the Primary Market: January–June 2021. London: Climate Bonds Initiative.

²⁸⁷ Intesa Sanpaolo (2024e) 'Italian corporate ESG bonds 2024', Research Note (Italian bond corporate ESG 2024), 7 November.

UniCredit also provides information about ESG in its 2023–2024 ESG Strategy Presentation, indicating it plans to achieve over €150 billion in cumulative ESG volume over several years, with approximately €61–62 billion already achieved in early 2023 (UniCredit Group, 2023)²⁸⁸ in sustainable loans, bonds, and advisory mandates, where green and sustainability bonds will play a specific but clear role.

A 2023 sustainability bond report, describing a €1.25 billion green senior preferred issue, reported total orders of roughly €3.3 billion (oversubscribed by around 2.6 times), with 87% of allocations to investors that have ESG or SRI mandates, and the geographic distribution of demand was very diversified across core Europe, the UK and the Nordics (UniCredit Group, 2023)²⁸⁹.

The bank received similar demand for a subsequent €1 billion sustainability bond, with a total order book of around €2.6 billion, and allocated around 78% to ESG-oriented buyers. Treasuries of banks and asset managers were the dominant buyers, while insurers and pension funds provided smaller but strategic tickets (UniCredit Group, 2023)²⁹⁰.

According to UniCredit's allocation reporting, the proceeds of green bonds are primarily used for mortgage and project financing portfolios. For example, for one flagship transaction, approximately 61% of allocations were made to green residential and commercial mortgages, and approximately 39% to project financing; most of these assets are located in Italy, although there is a material amount in Germany and Central Europe. UniCredit states that more than three-quarters of the assets financed are either taxonomy-eligible or taxonomy-aligned under the current EU rules and therefore provide a credible link between the labelled bond documentation and the Pillar 3 GAR templates.

In terms of GAR levels, external analyses of UniCredit's 2023 taxonomy disclosures indicate that the bank has a Green Asset Ratio of approximately 1.8%, which is roughly half that of Intesa Sanpaolo and somewhat below the average ratio for the largest Italian banks (RSM S.p.A., 2024)²⁹¹. The difference in GAR levels is due to the differing starting positions: UniCredit has a legacy loan portfolio that includes a larger proportion of corporate and CEE exposures that are not yet taxonomy aligned, and the bank has taken a more measured approach to restructuring the stock of assets, even though it has rapidly expanded new green business. However, the climate risk metrics in UniCredit's Pillar 3 and TCFD reports reflect a reduction in the emission intensity of high-impact sectors (such

²⁸⁸ UniCredit Group (2023) UniCredit ESG Strategy overview, investor presentation, June 2023, slide 5

²⁸⁹ UniCredit Group (2023c) Sustainability Bond Report 2023. Milan: UniCredit SpA, pp. 5–6.

²⁹⁰ UniCredit Group (2023c) Sustainability Bond Report 2023. Milan: UniCredit SpA, p. 6.

²⁹¹ RSM S.p.A. (2024) RSM presenta il primo studio sul GAR (Green Asset Ratio) delle banche italiane, comunicato stampa, Milan, 20 novembre, p. 1

as power, automotive, and real estate), and the bank expects the GAR to grow as more of its new lending meets technical screening criteria (UniCredit Group, 2023)²⁹².

From a pricing perspective, UniCredit's labelled bonds have generally traded at the tighter end of the guidance range and at or slightly inside the bank's implied fair value from its secondary curve. As a result, syndicate commentary on the €1.25 billion green senior preferred notes noted a minor tightening between IPT and FRO levels, with no "green premium" evident amid volatile market conditions. The oversubscription multiples of 2.6x to 3.3x (UniCredit Group, 2023)²⁹³, combined with high levels of ESG investor engagement, suggest that the label improves the quality of the book and may give the issuer some limited additional flexibility to reduce spread levels, but the net effect is marginal rather than significant. In secondary markets, the spreads on UniCredit senior preferred green and vanilla bonds tend to be within a few basis points of each other, once differences in maturity and liquidity are accounted for, consistent with the general finding in Chapter 7 that any greenium is primarily a phenomenon of the primary market (Climate Bonds Initiative, 2022)²⁹⁴.

In summary, UniCredit represents a different version of the same story seen at Intesa Sanpaolo: a large, developing green asset base, a meaningful but non-transformative GAR, and a labelled-bond program that generates large books and marginally better pricing than vanilla, without creating a structural separation of green from vanilla funding.

3.4.3 BNP Paribas: framework, Pillar 3, pricing, demand

BNP Paribas operates on a unique scale and regulatory boundary. The bank's framework for its green and sustainability bond program has been continually amended since 2016 (most recently in 2024) to align with the EU's Taxonomy and the upcoming EU Green Bond Standard (BNP Paribas, 2025)²⁹⁵. BNP Paribas views labelled bonds as part of an even larger transition finance strategy: From approximately \$28.2 billion in credit exposure to low-carbon energy technology in 2022 to approximately \$38.3 billion in credit exposure in late 2025, and the proportion of low-carbon energy in BNP Paribas' overall energy-financing portfolio went from approximately 54% to approximately 82%. BNP Paribas aims to reach 90% by 2030 (BNP Paribas, 2025)²⁹⁶. Also, during this period, BNP Paribas' financed emissions in the oil and gas sector declined by approximately 18.8 million metric tons of CO₂-eq. per year (from approximately 27.3 million metric tons in 2022 to approximately 9.5

²⁹² UniCredit Group (2023d) Principles for Responsible Banking Report 2023 (UNEP FI), Milan, pp. 24–35

²⁹³ UniCredit Group (2023c) Sustainability Bond Report 2023. Milan: UniCredit SpA, pp. 5–6.

²⁹⁴ Climate Bonds Initiative (2022) Green Bond Pricing in the Primary Market: H1 2022, London: Climate Bonds Initiative, pp. 3–4

²⁹⁵ BNP Paribas (2025a) Green Bond Framework. Paris: BNP Paribas Group updated May 2025.

²⁹⁶ BNP Paribas (2025b) Sustainable finance: follow our progress in figures. Paris: BNP Paribas Group.

million metric tons in 2024), with a stated goal of reducing them to 8.2 million metric tons by 2030 (BNP Paribas, 2025)²⁹⁷.

In sustainable-bond league tables, BNP Paribas has consistently led globally. In quarterly results presentations for 2023, the bank notes that it was ranked first in the world in terms of green bond issuance and sustainable finance volume for at least one quarter in 2023, with sustainable bond and loan volume of over \$60-\$70 billion in that single quarter alone. BNP Paribas' labelled funding provides funding for green, social, and sustainability bonds in various currencies, including large benchmark euro deals (typically sized at €1- €2 billion) and currency-specific deals designed for particular asset pools, such as renewable project financing or affordable housing lending.

Taxonomy and Pillar 3 reporting offer additional insight into the alignment of BNP Paribas' balance sheet. BNP Paribas' 2023 universal registration document and taxonomy appendix include a taxonomy-aligned numerator of approximately €9.3 billion in exposures for the GAR calculation based on turnover, distributed across climate change mitigation, climate change adaptation, and other environmental objectives. Using the current narrow definition of alignment, the bank's GAR as a percent of total on-balance-sheet exposures remains below 1% (BNP Paribas, 2024)²⁹⁸; however, the stock of taxonomy-eligible assets far exceeds this numerator and includes a detailed sectoral breakdown of alignment trajectories, including explicit reduction paths for financed emissions for power, oil and gas, automotive, steel, aluminium, and cement. With regard to electricity generation, the bank reports a decrease in the CO₂-intensity of its financed portfolio from approximately 179 gCO₂/kWh in 2022 to approximately 148 gCO₂/kWh in 2023 and 129 gCO₂/kWh in 2024, with a 2025 target substantially below 150 gCO₂/kWh, nearly half the value indicated by the IEA's global net-zero scenario (BNP Paribas, 2025)²⁹⁹ (BNP Paribas, 2024)³⁰⁰.

As a structuring bank and underwriter, the bank actions influence pricing and demand in its labelled transactions. Reports from investor presentations and allocation reports show that the bank's green and social bonds attract large geographically diverse order books, with strong participation from European asset managers, insurers, and central banks. For many of the bank's benchmark transactions, subscriptions have been more than double, and the final price paid by investors has been at or slightly inside the secondary curve, consistent with the relatively small greenium observed in Chapter 7.

²⁹⁷ BNP Paribas (2025b) Sustainable finance: follow our progress in figures, section “Financed emissions for the oil and gas sector”.

²⁹⁸ BNP Paribas (2024c) Aligned activities under the meaning of the European Taxonomy – 2024 reporting. In: Universal Registration Document 2024, pp. 804–808.

²⁹⁹ NP Paribas (2025b) Sustainable finance: follow our progress in figures. Paris: BNP Paribas Group. Sections: “Financing low-carbon energy”, “Percentage of energy financing dedicated to low-carbon”.

³⁰⁰ BNP Paribas (2024b) Climate-Related and Environmental Risk Disclosures (Pillar 3). Paris: BNP Paribas.

Concurrently, the bank has announced that it has ceased providing new bond financing for oil and gas companies focused on exploration and production and has concentrated its debt underwriting capacity on issuers with credible transition plans; this limits the number of high-emissions borrowers and solidifies the linkage between the bank's underwriting franchise and its own GAR and financed emissions targets.

Overall, BNP Paribas illustrates what a "Rule Stack-native" universal bank looks like: a small yet increasing GAR (BNP Paribas, 2024)³⁰¹, rapid reallocation of energy-sector exposures, and a labelled-bond program that complements rather than replaces decarbonization of the underlying balance sheet (BNP Paribas, 2025)³⁰². While there are pricing advantages available, they are directly tied to the bank's ability to generate large amounts of taxonomy-related assets and to credibly exit the most carbon-intensive segments.

3.4.4 HSBC: framework, Pillar 3, pricing, demand

HSBC expands its sustainable finance strategy by considering its position across Asia, the UK, and emerging markets. A key part of HSBC's sustainable finance strategy is an ambition announced in 2022 to deliver and facilitate between \$US750 billion and \$US1 trillion in sustainable finance and investment by 2030 (HSBC Holdings plc, 2022)³⁰³. On 31 December 2023, the bank reported cumulative sustainable finance and investment activity of approximately \$US294.4 billion since 2020 (HSBC Holdings plc, 2023)³⁰⁴. Total sustainable finance and investment activity increased by \$US83.7 billion (a 28% increase) (HSBC Holdings plc, 2023)³⁰⁵ within one year. Approximately \$US258.3 billion of this total relates to green/sustainable activities, while approximately \$US36.1 billion relates to social activities (HSBC Holdings plc, 2025)³⁰⁶. By mid-2025, total sustainable finance volumes increased to approximately \$US447.7 billion. In the first six months of 2025, sustainable finance and investment volumes were approximately \$US54.1 billion (HSBC Holdings plc, 2025)³⁰⁷.

As part of its labelled bond activities, HSBC has issued SDG-themed bonds, as well as several green, social and sustainability bonds across currencies. One of HSBC's early SDG-themed bond issuances was made under a commitment to achieve \$US100 billion in sustainable finance by 2025: a

³⁰¹ BNP Paribas (2024a) Aligned activities under the meaning of the European Taxonomy – 2024 reporting. In: Universal Registration Document 2024, Paris: BNP Paribas, pp. 804–808.

³⁰² BNP Paribas (2025a) Green Bond Framework, Paris: BNP Paribas Group.

³⁰³ HSBC Holdings plc (2022) Update on Climate Ambition – Investor Presentation, HSBC Holdings plc, London, p. 6.

³⁰⁴ HSBC Holdings plc (2024a) Annual Report and Accounts 2023, London: HSBC Holdings plc, p. 54.

³⁰⁵ HSBC Holdings plc (2024a) Annual Report and Accounts 2023, p. 54

³⁰⁶ HSBC Holdings plc (2025a) 1H 2025 Earnings Release, London: HSBC, p. 18.

³⁰⁷ HSBC Holdings plc (2025a) 1H 2025 Earnings Release, p. 18.

commitment that was met prior to the new ambition to deliver and facilitate between \$US750 billion and \$US1 trillion in sustainable finance and investment by 2030 (HSBC Holdings plc, 2021)³⁰⁸. Additionally, HSBC has acted as lead manager for a large share of sovereign and corporate green issuances in Asia and the UK (HSBC Holdings plc, 2024)³⁰⁹, thereby establishing itself as a conduit for transition finance across sectors such as infrastructure, renewable energy, and sustainable transportation.

Although HSBC is not directly subject to the European Union's Green Asset Ratio ("EU GAR") regulation at the consolidated group level, it provides climate risk metrics and financed emissions targets that are consistent with its net zero commitments. As examples of this reporting, the group has disclosed a 57.3% decrease in absolute greenhouse gas emissions from its own operations between 2019 and 2023 (HSBC Holdings plc, 2024)³¹⁰. It has also established sectoral-financed emissions-reduction targets for power, oil & gas, and other carbon-intensive sectors (HSBC Holdings plc, 2024)³¹¹. The bank's ESG data pack and Transition Reporting Disclosure Framework (TCFD)-aligned entity report provides granular breakdowns of lending exposures by sector, financed emissions baselines, and decarbonization pathways.

From a market pricing perspective, HSBC's labelled bonds and those it arranges for clients have generally been priced in-line with the larger greenium trends previously noted: very strong demand from ESG-labelled funds, order books that are frequently oversubscribed by 200 to 300 percent of the issue size, and final pricing that is either at fair-value or a few basis points inside the conventional yield curve for comparable non-green paper (HSBC Holdings plc, 2023)³¹² (Climate Bonds Initiative, 2023)³¹³. However, the bank has been criticized for continuing to fund fossil fuel projects, with external studies indicating that UK-based banks, including HSBC, have collectively provided tens of billions of pounds to companies involved in high-emissions "carbon bombs" (Rainforest Action Network, 2024)³¹⁴. This tension between ambitious sustainable finance objectives and existing fossil fuel exposure represents reputational and regulatory risks that feed back into investor perceptions, particularly for labelled transactions.

³⁰⁸ HSBC Holdings plc (2021) SDG Bond Framework & Impact Report, London: HSBC, pp. 2–3.

³⁰⁹ HSBC Holdings plc (2024b) Debt Capital Markets – Sustainable Bonds Annual Review 2024, London, pp. 4–6.

³¹⁰ HSBC Holdings plc (2024c) ESG Datapack 2023, London: HSBC, p. 12.

³¹¹ HSBC Holdings plc (2024d) Transition Plan 2024 (TCFD-aligned), London: HSBC, pp. 20–35.

³¹² HSBC Holdings plc (2024b) Sustainable Bonds Annual Review 2024, pp. 7–9.

³¹³ Climate Bonds Initiative (2023) Green Bond Pricing in the Primary Market: H2 2023, London: CBI.

³¹⁴ Rainforest Action Network (2024) Banking on Climate Chaos 2024, San Francisco: RAN, pp. 22–25.

Given the current context, HSBC's labelled bond demand is driven by the attractiveness of the proceeds categories and by investors' confidence that the bank's overall balance sheet is transitioning towards a net-zero outcome. While the progressive increases in sustainable finance volumes, the large inventory of green/sustainable assets, and the demonstrable decreases in financed emissions in select sectors provide evidence of the bank's progress, the credibility of these trajectories will be tested by the speed with which the bank can reconcile its climate ambitions with pressures to continue funding carbon-intensive customers. From the perspective of this thesis, HSBC serves as an example of how global banks may support large labelled-bond markets while still having significant transition risk and how that tension can influence the persistence and magnitude of any price premium.

3.4.5 Santander: framework, Pillar 3, pricing, demand

Santander completes the sampling of banks through a business model focused primarily on retail customers and small- and medium-sized enterprises (SMEs), while also expanding a sustainable financing platform in Europe and Latin America. The bank's Green, Social & Sustainability Global Funding Framework defines categories of eligible funding, including renewable energy, energy-efficient construction, clean transportation, SME finance in less developed regions, and inclusive infrastructure (Santander Group, 2022)³¹⁵. In addition to providing a funding mechanism under this framework, Santander issues green, social, and sustainability bonds at the parent company and subsidiary levels to support a comprehensive balance-sheet approach to green financing (Sustainalytics, 2022)³¹⁶. According to the bank's reporting, from 2019 through 2025, approximately €139 billions of green finance was raised and facilitated by the bank, exceeding the bank's original goal of raising €120 billion from 2019 through 2025; Santander now seeks to achieve a cumulative total of €220 billion in green finance by 2030 (Banco Santander, 2024)³¹⁷.

Reports detailing green-bond allocations and impacts describe a portfolio of eligible assets comprising renewable-energy project finance, green mortgage products, and loans for energy-efficient construction. A recent report notes that the eligible green portfolio was valued at approximately €5–6 billion, supporting the bank's issuance of approximately €3 billion in outstanding green bonds, and that approximately 70–80 individual projects are funded. These projects have added over 20 gigawatts of renewable capacity and are estimated to avoid over 700,000 tonnes of CO₂-

³¹⁵ Santander Group (2022) Santander Group Green, Social and Sustainability Funding Global Framework, Madrid: Banco Santander, S.A., pp. 3–4, 10–12.

³¹⁶ Sustainalytics (2022) Santander Group Green, Social and Sustainability Funding Global Framework – Second-Party Opinion, Amsterdam: Sustainalytics, pp. 3–5.

³¹⁷ Banco Santander (2024) Sustainability Statement 2024, Madrid: Banco Santander, S.A., pp. 10–11.

equivalent emissions each year (Banco Santander, 2025)³¹⁸. Although the technologies and geographic areas represented in these projects can vary significantly from year to year, they include numerous solar parks, wind farms, and hydroelectric facilities. During 2023, Santander was involved as lead arranger in over 80 renewable-energy financing transactions totalling approximately 13–14 GW of generation capacity, sufficient to power over 10 million homes, and the bank was the sole financier of a portfolio of 24 photovoltaic plants located throughout Spain, valued at more than €500 million (ClassiFYIed, 2024)³¹⁹.

Although Santander does not rank among the top GAR (green, accountable and responsible) banks in the EU, the bank has begun disclosing more detailed information on the proportion of its taxonomy-eligible and taxonomy-aligned assets, particularly within its European subsidiaries. The bank's climate transition plan highlights several initiatives to reduce its thermal coal-related exposure, increase its offerings of green mortgages and energy-efficiency loans, and align the emissions intensity of its power generation activities with the requirements of the Paris Agreement. By early 2025, Santander reported achieving its 2019–2025 green finance goals ahead of schedule and mobilizing more than €140 billion in cumulative green finance since 2019, suggesting both strong client demand for green finance and sufficient internal capacity to generate taxonomy-compliant assets (Banco Santander, 2023)³²⁰ (Accenture, 2024)³²¹.

Capital-market participants have shown consistent interest in Santander's labelled bonds, primarily from ESG-investors based in Europe, Latin America, and Asia. This investor demand for labelled bonds has been driven, in part, by Santander's leadership in renewable-energy project finance. Benchmark labelled green or sustainability bonds typically represent €500 million to €1.5 billion and generally demonstrate subscription multiples ranging from two to three times the size of the issue (Banco Santander, 2025)³²². Distribution of labelled bonds is generally skewed in favor of asset managers, commercial banks, and, to a lesser degree, insurers and official institutions. Labelled-bond pricing outcomes generally indicate that the final spread is at the tight end of the guidance provided to investors, and in some instances, priced at a premium to the bank's conventional yield curve for

³¹⁸ Banco Santander (2025) Green Bond Report 2024, Madrid: Banco Santander, S.A., pp. 5–8.

³¹⁹ ClassiFYIed (2024) 'Solaria breaks records with 107.5 million net profit and accelerates its international expansion with 50% of its project portfolio outside Spain', ClassiFYIed, 29 February, para. 4

³²⁰ Banco Santander (2023) Climate Finance Report 2023, Madrid: Banco Santander, S.A., pp. 14–20.

³²¹ Accenture (2024) The Green Asset Ratios are here – Observations from EU Taxonomy reporting. Dublin: Accenture plc, pp. 6–7.

³²² Green Bond Report 2024. Madrid: Santander, pp. 6–10.

similar tenors and seniorities, resulting in a modest primary greenium, which compares to the primary greenium observed for Intesa, UniCredit, and BNP Paribas.

The experience of Santander illustrates the significance of both scale and geographic diversity for delivering on sustainable finance commitments. The sustainable finance targets established by Santander are smaller than those of BNP Paribas and HSBC in absolute terms; however, when compared to Santander's balance sheet, these targets are substantial and highly concentrated in segments such as residential mortgages and SME lending that are key to the objectives outlined in the EU taxonomy for the renovation of buildings and the reduction of energy consumption. Therefore, the demand for Santander's green bonds reflects both the Group's creditworthiness and the credibility of its renewable energy and green lending franchises. As Santander transitions from €139 billion in cumulative green finance to €220 billion by 2030, investors will increasingly focus on the quality rather than simply the quantity of the underlying assets being funded.

3.4.6 Cross-bank scoreboard

Although the five banks share similarities in how they implement green lending and labelled funding, and in how they have evolved over time (convergence), they also differ in their specific green finance and labelled bond implementation strategies (divergence).

All five banks have implemented very ambitious green finance targets, although they differ in scope, geography, and ambition. For example, the green finance target of Intesa Sanpaolo is of approximately €76–88 billion for 2022–2025 (Intesa Sanpaolo, 2024)³²³, for green and circular economy lending, and the cumulative green finance target of Santander for 2019–2030 is approximately €220 billion. However, the green finance programme of Intesa Sanpaolo will mainly take place in Italy and be tied to the Italian National Recovery and Resilience Plan (NRRP). Santander's green finance programme will cover both Europe and Latin America.

In addition, the reported disbursement figures for the green transition programme of Intesa Sanpaolo as of 2025 are approximately €89 billion, exceeding its initially defined target (Intesa Sanpaolo, 2025)³²⁴. The reported figure for Santander's green finance mobilization since 2019 is approximately

³²³ Intesa Sanpaolo (2024a) Group Sustainability Report 2023, Turin: Intesa Sanpaolo, pp. 32–35.

³²⁴ Intesa Sanpaolo (2025) Sustainability Bond Report 2024, Milan: Intesa Sanpaolo, pp. 5–7.

€139 billion, and it still needs to mobilize an additional €80 billion to meet its 2030 target (Banco Santander, 2024)³²⁵.

Furthermore, the total volume of UniCredit's ESG activities (including green, social, and sustainability-linked) amounts to more than €150 billion and is thus comparable to the volume of Santander's green finance programme in euro terms, although it covers a broader scope (UniCredit, 2023)³²⁶. In addition, UniCredit achieves its ESG activity volume from a balance sheet with a smaller share of taxonomy-aligned assets.

BNP Paribas and HSBC have significantly higher volumes of ESG activities than their Italian peer banks. BNP Paribas has allocated more than €38 billion in credit exposure to low-carbon energy sources until 2025, and low-carbon technologies represent more than 80% of its energy sector exposures. Furthermore, BNP Paribas has committed more than €215 billion of financing to the energy transition by 2026 (BNP Paribas, 2024)³²⁷. HSBC has already provided more than \$294 billion in sustainable finance and investments between 2020 and 2023, and approximately \$448 billion through mid 2025, and it aims to provide a total of \$750 billion–\$1 trillion in sustainable finance and investments by 2030 (HSBC Holdings plc, 2024)³²⁸ (HSBC Holding plc, 2025)³²⁹.

In relation to the taxonomies and the GAR dimensions of the five banks, the scoreboards look quite different. Intesa Sanpaolo is a relative outlier among EU-headquartered banks in its Green Asset Ratio (GAR), which stands at approximately 3.3%. In comparison, UniCredit's GAR is approximately around 2%-3%, and BNP Paribas' is lower than 1% under the current narrow definition of alignment. These differences reflect the fact that the five banks have different balance sheet compositions and operate in different national contexts. Italian banks hold a large portfolio of residential mortgages and SME loans that can be aligned through energy efficiency and renovation programs. In contrast, BNP Paribas has a more diversified global portfolio, and the conservative interpretation of technical screening criteria keeps its GAR low, although its energy sector exposures are rapidly decarbonizing (Intesa Sanpaolo, 2024)³³⁰ (Unicredit, 2024)³³¹ (BNP Paribas, 2024)³³². HSBC and Santander do not disclose their GARs because their consolidated groups are not fully subject to the EU GAR regime.

³²⁵ Banco Santander (2024a) Sustainability Statement 2024, Madrid: Santander, pp. 10–12.

³²⁶ UniCredit (2023a) ESG Strategy Update – 2023 Presentation, Milan: UniCredit Group, pp. 9–12.

³²⁷ BNP Paribas (2024a) 2023 Universal Registration Document, Paris: BNP Paribas, pp. 330–345.

³²⁸ HSBC Holdings plc (2024a) Annual Report and Accounts 2023, London: HSBC, pp. 54–55.

³²⁹ HSBC Holdings plc (2025a) 1H 2025 Earnings Release, London: HSBC, p. 18.

³³⁰ Intesa Sanpaolo (2024c) Pillar 3 Disclosure 2023, pp. 215–218

³³¹ UniCredit (2024a) Pillar 3 Disclosure 2023, pp. 185–187

³³² BNP Paribas (2024a) 2023 Universal Registration Document, pp. 340–345

Instead, they disclose other quantitative metrics that allow for a qualitative ranking of ambition and progress. For example, HSBC discloses financed emission reduction trajectories, and Santander discloses cumulative green finance volumes.

In addition, labelled bond issuance volumes and pricing results show more convergence across the five banks. All five banks are active in issuing green, social or sustainability bonds in the form of benchmark-sized labelled bonds. Typically, the five banks' labelled bond issuances range from €500 million to €2 billion. The order books for labelled bond issuances by the five banks are frequently two to three times oversubscribed, and ESG-oriented investors account for 70–90% of allocations to euro-denominated benchmark labelled bonds issued by Intesa, UniCredit, BNP Paribas, and Santander (Climate Bonds Initiative, 2023)³³³ (Moody's Investors Service, 2023)³³⁴. In addition, the multi-currency labelled bonds and SDG-themed labelled bonds of HSBC have similar high allocation rates to dedicated sustainable finance funds and official sector portfolios (HSBC Holdings plc, 2022)³³⁵. Primary market pricing studies of the five banks conclude that greenium magnitudes of 1–5 basis points exist for senior preferred or covered labelled bonds, with green labelled bond issuances frequently priced at the tight end of guidance and sometimes slightly inside the vanilla curve (Climate Bonds Initiative, 2023)³³⁶. Secondary market greeniums are generally compressed towards zero when liquidity and tenor are controlled for.

Therefore, the study's overall scoreboard suggests a nuanced view of "green leadership". According to the GAR and taxonomy alignment criteria, Intesa Sanpaolo is highly ranked among Italian banks. With respect to the rapid decarbonisation of energy exposures and the low carbon financing intensity, BNP Paribas is leading the group of banks. According to absolute sustainable finance volumes, HSBC and BNP Paribas are far ahead of their Italian peers. Finally, based on the speed of achieving the respective targets, Santander is leading the group, having reached its 2019–2025 green finance target ahead of schedule. In addition, all five banks experience strong demand for their labelled bonds and modest greenium effects, although none of them have been able to structurally separate green financing costs from vanilla financing costs in the secondary markets.

Overall, the comparative analysis supports three main conclusions for the thesis. Firstly, the Rule Stack is already having a direct impact on bank balance sheets, as GARs, financed emission

³³³ Climate Bonds Initiative (2023) Green Bond Pricing in the Primary Market – H2 2023, pp. 4–12.

³³⁴ Moody's Investors Service (2023) ESG – European Financials: Green Bonds Pricing Review, pp. 6–10.

³³⁵ SDG Bond Framework & Impact Report, London: HSBC, pp. 4–8.

³³⁶ Climate Bonds Initiative (2023) Green Bond Pricing in the Primary Market – H2 2023, pp. 5–10.

reductions, and green finance targets result in tangible changes in banks' portfolios and order books (European Central Bank, 2024)³³⁷. Secondly, the greenium emerging in primary markets is closely related to the credibility of the bank's commitment to green finance and the operational advantages of labelled assets for ESG-mandated investors, rather than to abstract statements regarding the environmental virtues of banks' actions (Financial Stability Board, 2023)³³⁸. Finally, there is no universal model of "green banking", and the scope of the taxonomy-aligned portion of the balance sheet, the rate of decline in financed emissions, and the extent to which labelled bonds can generate pricing benefits depend on the national context, the business mix of the bank, and the strategic decisions taken by the bank.

Chapter 4

Beyond Compliance: Governance, Investors, and the Future of Sustainable Finance

4.1 Governance That Makes Sustainability Defensible

The prior chapters have demonstrated that credibility in sustainable debt markets has materiality for both investors and issuers. Claims cracking will have repercussions on spreads and can lead to mandates being excluded, higher refinancing costs, and regulatory actions against an issuer, among other factors. The difference in terms of the upside potential of credibility versus the downside potential of governance failures explains why the future direction of sustainable finance will not be to expand disclosure requirements, but to develop the governance architecture that supports those disclosures. The issue is no longer simply whether issuers disclose sustainability-related information, but what systems are in place to prevent weak claims from being issued.

"Governance that 'bites' means that there are internal systems in place that create verifiable accountability for sustainability claims. Sustainability claims would be part of the company's internal control system (e.g., internal audit, risk management), with similar escalation processes as exist for financial reporting. As such, when sustainability-related information is communicated to investors via a prospectus or impact report, it is assumed to be verifiable by third parties and, therefore, subject to legal liability.

³³⁷ European Central Bank (2024) Climate and Supervision Report 2024, Frankfurt: ECB, pp. 20–32

³³⁸ Financial Stability Board (2023) Climate-related Financial Risks: Market Pricing Effects, Basel: FSB, pp. 11–19.

This transition is evident at various levels of regulation in Europe. As such, the European regulatory landscape is starting to treat sustainable finance as a domain of market integrity (i.e., rules-based), rather than an area of marketing. Therefore, the regulatory trajectory is aligning sustainable finance governance with prudential governance.

The European regulatory "stack" provides additional support to this trend. Discipline at the instrument level is provided through the EU Green Bond Framework, which establishes requirements for companies to develop structured pre-issuance documentation and post-issuance reporting on allocation (European Parliament and Council, 2023)³³⁹. Disciplinary action at the portfolio level is implemented through naming constraints that increase investor due diligence requirements and require fund managers to justify holdings using quantifiable metrics. Finally, disciplinary action at the prudential level is provided through Pillar 3 ESG disclosures, which report comparable ESG measures that convert non-fiscal sustainability narratives into quantifiable fiscal indicators (European Banking Authority, 2022)³⁴⁰. As such, sustainable issuance cannot remain separate from other areas of institutional governance and must instead become a component of treasury and/or communications functions.

The economic role of governance that bites is to decrease verification costs and align internal incentives. Treasury teams want to maximize execution efficiencies. Sustainability teams want to promote ambitions. Risk teams want to see a coherent view of overall risk. Compliance teams want to demonstrate the defensibility of their reporting. Without a governance structure that can tie these different incentives together, labelled instruments may be created primarily for narrative appeal (e.g., "green") rather than for the consistency of the evidence supporting the label. Governance that bites creates internal coherence: labelled issuance must be consistent with the taxonomy mappings required to support the label; with the balance-sheet exposure reporting; and with the institution's risk appetite (European Parliament and Council, 2020)³⁴¹.

Regulatory developments also reinforce the logic described above. Climate governance is no longer considered a strategic preference, but rather a prudential responsibility. Companies are now evaluated

³³⁹ European Parliament and Council (2023) Regulation (EU) 2023/2631 of the European Parliament and of the Council of 22 November 2023 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds. Official Journal of the European Union, L 2023/2631.

³⁴⁰ European Banking Authority (2022) Final report: Draft Implementing Technical Standards on prudential disclosures on ESG risks in accordance with Article 449a CRR.

³⁴¹ European Parliament and Council (2020) Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088. Official Journal of the European Union.

on their ability to include environmental risks within their governance, risk management, and internal control frameworks (European Central Bank, 2020)³⁴². If deficiencies persist, regulatory bodies may escalate the situation. The signalling effect is significant: sustainable governance will be held to the same regulatory standards as capital adequacy, liquidity management, and internal model validation (European Central Bank, 2025)³⁴³.

Therefore, the transformation is structural. Sustainable debt credibility relies less on the beauty of the framework narratives and more on the strength of the internal systems that produce replicable evidence. Governance that bites does not eliminate sustainability risk; it decreases the likelihood that unsubstantiated claims reach investors. In that sense, it represents a preventative architecture, not a reactive one.

The following sections describe the three elements of this preventative architecture: Board-level oversight and internal controls; Independent Review with Conflict-of-Interest Safeguards; and Data Lineage Systems to enable Traceability from Issuance to Prudential Disclosure.

4.1.1 Internal controls and board oversight for labelled debt

The degree to which internal control systems support operational embedding rather than rhetorical endorsement of sustainable finance will depend on how well labelled debt markets are supported internally, i.e., the internal control systems' ability to ensure consistency, documentation, and verifiability of use-of-proceeds commitments, taxonomy mapping, allocation tracking, and impact reporting. Without these internal control systems, labelled sustainable issuance risks are fragmented between different departments and are based on inconsistent narratives compared to the evidence presented in the company's annual reports (European Central Bank, 2022)³⁴⁴.

A key structural component for ensuring the potential of sustainable financing is realised is the oversight provided by the board of directors. As sustainable financing represents both a funding strategy and an opportunity to position one's firm in a positive light relative to its peers regarding transition risk (i.e., long term), it is critical that the board provide some form of oversight rather than allowing this area to be solely under the purview of the sustainability team(s) and/or treasurer's

³⁴² European Central Bank (2020) Guide on climate-related and environmental risks. Frankfurt am Main: European Central Bank (Banking Supervision).

³⁴³ European Central Bank (2025) 'ECB imposes periodic penalty payments on ABANCA for failing to sufficiently identify climate risks', Press release, 10 November.

³⁴⁴ European Central Bank (2022) 2022 climate risk stress test. Frankfurt am Main: European Central Bank (Banking Supervision).

function. By providing this oversight, the board ensures strategic alignment of the firm's sustainable finance activities with its overall risk appetite framework, its capital plan, and any broader transformational strategies. Boards of directors who oversee sustainability targets and labelled issuance frameworks are less likely to allow the two to diverge from the firm's overall risk and capital strategies.

Effective oversight by boards of directors of their firm's sustainability activities can be identified through several specific artefacts. These include board approval of sustainable finance frameworks; formal board review of the criteria used to determine eligibility for labelled issuance; oversight of processes for allocating proceeds from labelled issuance; and formal review of the reconciliation between labelled issuance commitments and prudential disclosure requirements (European Banking Authority, 2022)³⁴⁵. While the presence of a sustainability committee does not guarantee effective oversight, the incorporation of sustainability-related decision making into the firm's existing governance structure (e.g., through the establishment of a sustainability subcommittee of the firm's risk committee, or through the inclusion of a sustainability representative on the firm's audit committee) will facilitate the effective oversight of the firm's sustainability activities.

In addition to the oversight described above, effective internal control systems must also support the integration of taxonomy classification and data governance. Sustainable bonds typically allocate proceeds to loan or project portfolios that must be mapped to environmental objectives and screened against technical criteria. The mapping of these exposures must be consistent with the classification logic applied when preparing the firm's prudential disclosures. If internal systems apply different classification logics when classifying exposures across different reporting channels, the resulting inconsistencies will be evident to both investors and regulators. Therefore, internal control systems must establish centralized taxonomy interpretation, data validation protocols, and reconciliation mechanisms across business lines.

Finally, another important aspect of internal control systems supporting the effective operation of sustainable finance activities is the integration of the firm's treasury systems with its risk reporting systems. Tracking of allocations of proceeds from labelled issuance is not merely an accounting task; it is an exposure classification task. Proceeds allocated to eligible projects must be traceable to the underlying exposures, and these exposures must appear consistently in the firm's regulatory

³⁴⁵ European Banking Authority (2022) Final report: Draft Implementing Technical Standards on prudential disclosures on ESG risks in accordance with Article 449a CRR.

templates. Where the allocation systems are separate from the firm's risk data warehouse, the likelihood of inconsistency increases.

Finally, internal audits represent the last layer of control in this process. Sustainability-related issuance processes should be subjected to internal audit review similar to other significant financial processes. Audit reviews should test the methods used to track allocations, screen for eligibility, and calculate impacts for documentation quality and consistency. Furthermore, when audit findings are brought forward through the firm's governance channels, sustainability governance will gain credibility.

In conclusion, internal control systems convert the aspiration of sustainability into discipline. They ensure that labelled issuance is not a single, isolated branding effort but an integral component of an entire institutional system capable of sustaining scrutiny. Without this institutional integration, labelled sustainable finance claims risk being challenged as inconsistent or overstated (European Central Bank, 2020)³⁴⁶. However, with integration, labelled sustainable finance claims will be defensible and replicable.

4.1.2 Independent Review and Conflict Management

Reviewer independence, along with a clear definition of scope and rigorous methodology, will provide the credibility needed to reduce information asymmetry between issuers and investors in the external review process. Wherever reviewer independence or scope clarity is lacking, however, external review can easily become a formality, rather than a verification of claims made by issuers.

Thus, if corporate governance is going to "bite," reviewer mandates must be structured to minimize the potential for conflicts of interest and clearly define the limits of the reviewer's assurances (European Parliament and Council, 2023)³⁴⁷.

External reviewers in sustainable debt markets usually evaluate whether the framework aligns with industry norms, whether its eligibility rules are reasonable and logical, how proceeds are managed, and whether issuers have committed to disclose progress. However, the level of review varies. Some

³⁴⁶ European Central Bank (2020) Guide on climate-related and environmental risks. Frankfurt am Main: European Central Bank (Banking Supervision).

³⁴⁷ European Parliament and Council (2023) Regulation (EU) 2023/2631 of the European Parliament and of the Council of 22 November 2023 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds. Official Journal of the European Union, L 2023/2631.

reviews will simply determine whether the issuer's narrative aligns with the applicable framework. Other reviews will include an evaluation of the allocation of funds and some independent verification of certain impact metrics. Increasingly, investors distinguish between a superficial alignment opinion and a substantive allocation assurance opinion, which are economically significant differences (Flammer, 2021)³⁴⁸. Allocation assurance, unlike narrative alignment (which concerns the applicability of the framework), evaluates the integrity of the financial flow through the framework.

The primary source of conflict-of-interest risk in reviewing the sustainability of issuers' debt is when issuers pay reviewers. Since reviewers are paid by issuers, reviewers may feel pressure to provide a favourable assessment. To mitigate this risk, issuers must disclose the methodologies used by reviewers, the limitations of the review process, and the independence safeguards in place within reviewer organizations (European Securities and Markets Authority, 2025)³⁴⁹. Additionally, regulatory bodies can supervise reviewers to ensure they adhere to independence standards and maintain consistent methodologies (European Securities and Markets Authority, s.d.)³⁵⁰.

While the reviewer organization itself is responsible for mitigating conflict-of-interest risk, issuer governance also has a responsibility to reduce such risk. Issuers must select reviewers based on criteria that prioritize technical expertise, transparency of methodologies, and safeguards for independence, in addition to reputation. Periodically evaluating reviewer performance, particularly for frequent issuers, helps maintain reviewer accountability and avoid reviewer complacency.

The mandate definition for reviewers is also critical. Review opinions should clearly state what was evaluated and what was not. Specifically, if allocation assurance is not provided, the opinion must explicitly state this. Similarly, if impact metrics require issuer-provided assumptions, which are not independently validated, this should be stated in the review opinion. Clarity in mandate definition will help prevent investors from assuming assurance beyond what was actually reviewed.

When both reviewer independence and scope clarity are robust, verification costs decrease for investors, and mandate defensibility increases. Conversely, when these two conditions are weak, investor scepticism increases, and investor confidence may decrease. Therefore, reviewer governance is located at the nexus of market credibility and institutional accountability. Reviewer governance is not meant to replace internal control measures but to reinforce them by creating an external challenge

³⁴⁸ Flammer, C. (2021) 'Corporate green bonds', *Journal of Financial Economics*, 142(2), pp. 499–516.

³⁴⁹ European Securities and Markets Authority (ESMA) (2025) 'ESMA consults on rules for External Reviewers of EU Green Bonds', Press release, 7 April.

³⁵⁰ European Securities and Markets Authority (ESMA) (n.d.) External Reviewers of European Green Bonds.

function. For corporate governance to "bite" and create value, reviewer processes must be embedded in institutional oversight rather than viewed as transactional necessities. The results of the review must be discussed at the relevant governance committee(s), and any remediation of identified weaknesses must be documented. In this manner, the external review process will become part of a feedback loop that strengthens institutional systems rather than merely validating them ex ante.

4.1.3 Data Lineage, Audit Trails, and Evidence Thresholds

As stated above, the most technically significant element of Sustainable Finance Governance is Data Lineage. Data lineage is the ability to track the source of an issuing commitment, its allocation, its impact measurement, its taxonomy mapping, and its prudential disclosure. Sustainability claims are essentially meaningless without data lineage because they cannot be verified or reproduced; therefore, all that remains of a sustainability claim is a series of narrative statements, rather than empirical evidence.

Reproducibility is the defining feature of decision-useful information in sustainable debt markets (Zerbib, 2019)³⁵¹. For investors to make decisions based on sustainability claims, they need to identify the use-of-proceeds categories associated with their investment and map those categories to the underlying exposures and/or reported impact metrics. Similarly, regulators need to be able to link sustainability disclosures to the bank's balance sheet data. Finally, internal audit needs to evaluate the accuracy of the allocation process and the assumptions used to calculate the reported impacts. All these uses require a structure to support data storage, rather than a collection of unrelated documents.

To create a robust audit trail, the first step is to document the framework (or frameworks) used to determine whether or not a project qualifies for financing under a sustainability program. The documentation should describe each eligibility criterion precisely and include operational examples where possible. Next, the allocation system(s) should store project identifiers, allocation dates, and amounts. These fields will enable banks to reconcile the proceeds raised from sustainable funding instruments with the proceeds actually deployed. Finally, documentation of the methodologies used to calculate the impacts of bank-funded projects, including baseline assumptions, emissions factors, and calculation logic, should be stored (International Capital Market Association, 2023)³⁵². Additionally, changes to the methodology used over time should be tracked and explained.

³⁵¹ Zerbib, O.D. (2019) 'The effect of pro-environmental preferences on bond prices: Evidence from green bonds', *Journal of Banking & Finance*, 98, pp. 39–60.

³⁵² International Capital Market Association (ICMA) (2023) *Handbook: Harmonised Framework for Impact Reporting* (June). Zurich: ICMA.

In addition to documenting the processes and data fields required to produce an audit trail, banks must also develop crosswalks between the various reporting domains in which they operate. For example, banks must be able to link the proceeds received from sustainable funding instruments to the regulatory exposure classifications used in prudential reporting. If a bank reports taxonomy-aligned activities financed through green bonds inconsistently in its prudential disclosures, the bank creates credibility gaps. Therefore, consistency across domains is also a governance objective.

Finally, digitalization has reinforced the need for data lineages. As sustainability reporting shifts toward structured, machine-readable formats, inconsistencies become easier to detect (EFRAG, 2024)³⁵³. Machine-readability of sustainability reporting makes it less costly for comparators to compare and contrast sustainability performance and increases the likelihood that an external comparator will challenge a bank's sustainability claims (European Commission, 2023)³⁵⁴. In other words, banks without a clear, consistent data architecture may face increased scrutiny.

To create an effective data lineage system, a bank must integrate its treasury systems, risk data warehouses, sustainability databases, and reporting platforms. Ideally, a bank should design a data lineage system so that a claim appearing in a bond impact report can be traced back to the allocation records and forward to the prudential templates. When a bank creates a data lineage system capable of tracing sustainability claims from the point at which they are made to the point at which they are reported in prudential templates, the bank transforms sustainability claims from simple narrative descriptions into audit-ready artifacts.

If a bank lacks a robust data lineage system, it faces cumulative risk. Investor confidence may decrease, the bank may lose mandates, and supervisory intervention may increase. On the other hand, if a bank establishes a robust data lineage system, its sustainability claims will be part of a larger, coherent evidentiary ecosystem.

Ultimately, the conversion of green from a marketing term to decision-useful information depends on the technical infrastructure of a bank's data lineage system. Governance that "bites" includes oversight and review, as well as the technical systems required to generate, store, and reconcile evidence across the entire institutional architecture of a bank. Only when a bank develops an infrastructure capable of generating, storing, and reconciling evidence of sustainability claims will

³⁵³ EFRAG (2024) ESRS XBRL Taxonomy (Concluded).

³⁵⁴ European Commission (2023) Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU as regards European Sustainability Reporting Standards (ESRS). Official Journal of the European Union

the bank's sustainability claims withstand reproduction, challenge, and comparison (European Banking Authority, 2022)³⁵⁵.

1.5 Investor's perspective: what really drives demand

The investment demand for "sustainable" bank debt in Europe is rapidly shifting from value-based to rule-based, mandate-driven, and verifiable compliance. As such, the main practical issue facing investors is not to determine whether they would prefer green assets in general, but rather whether they can hold green assets without risking future exposure to either (i) internal breaches of mandate, (ii) regulatory review regarding the use of product names and marketing claims that may be misleading or deceptive, or (iii) reputational and performance issues due to credibility shocks. Therefore, the demand curve is shifting away from broad sustainability rhetoric and toward instruments that are legally defensible under the increasing regulatory rule stack. For this reason, in this dissertation, "green" stops being marketing once it provides useful decision-making information to investors: investors will pay for what can be verified and defended.

There are three major drivers of demand growth in the European banking sector. Firstly, asset managers are increasingly bound by labeling and marketing disciplines that require them to ensure product labels are consistent with measurable portfolio rules. Secondly, asset owners are converting their net-zero commitments into operational requirements that flow downward to managers, who then pass them along to issuers. Finally, the availability of reliable data infrastructure is becoming the limiting factor: portfolio alignment, financed emissions targets, and assessments of transition plans all require auditable data, not merely narratives. Therefore, together, these factors indicate that investors do not simply "buy green"; instead, investors buy those items that have survived three tests: (1) mandate eligibility; (2) evidence quality; and (3) forward-looking credibility.

Demand also has a microstructural component. In the book-building process for bank-issued sustainable debt, the strongest and stickiest demand typically originates from real-money accounts with long-term liabilities and specific policy constraints: pension funds; insurers; central bank-eligible portfolios, where applicable; and managers operating ESG-labeled strategies subject to client scrutiny. Investors within each of these categories are more concerned about the integrity of the label because they cannot quickly exit if controversy arises, and because the length of their holding periods

³⁵⁵ European Banking Authority (2022) Final report: Draft Implementing Technical Standards on prudential disclosures on ESG risks in accordance with Article 449a CRR.

means that governance failures can have serious financial implications. Therefore, demand is not merely "more ESG," but rather "more defensible ESG."

In practice, the investor perspective is translated into a series of screening questions. Does the instrument directly relate to the way in which funds are named and disclosed pursuant to the Sustainable Finance Disclosure Regulation (SFDR) (European Commission, 2022)³⁵⁶? Can the issuer provide evidence that the label is supported by allocation discipline, taxonomy logic where appropriate, and post-issue reporting? Are the KPIs utilized by the issuer stable, comparable, and reconciled with the prudential disclosure obligations of banks? Is the issuer's transition strategy credible, in the sense that it corresponds to a measurable path rather than merely an aspiration? Each of these is not a speculative concern; they are now embedded in European supervisory and market infrastructure (European Parliament and Council, 2019)³⁵⁷.

4.2.1 How Fund Labels Shape Capital Allocation

The rules regarding the names of ESMA funds were among the most straightforward regulatory measures, turning sustainability terminology into a measurement of portfolio restrictions and, therefore, among the most visible channels of regulatory influence on demand for labelled bonds. The primary insight of the article is that a fund's name is not a neutral description; it is usually the first signal an investor receives and greatly affects a fund's distribution. When a manager uses sustainability-related terms loosely, the fund's name primarily functions as a marketing tool rather than an informational one. ESMA's guidelines aim to turn the above logic on its head by defining when ESG-related terms in a fund's name become unfair, unclear, or misleading, and the requirements for fund managers to use these terms.

This regulatory measure is important because it affects what asset managers can sell, which, in turn, affects what they need to buy, which, in turn, affects what issuers can fund at low cost.

Mechanically, the ESMA framework is based on two levers: a qualitative threshold and exclusion screens. Funds using ESG or sustainability-related terms in their name are expected to meet an 80%

³⁵⁶ European Commission (2022) Commission Delegated Regulation (EU) 2022/1288 of 6 April 2022 supplementing Regulation (EU) 2019/2088 with regard to regulatory technical standards specifying the details of the content and presentation of information in relation to the principle of "do no significant harm", sustainability indicators and sustainability-related disclosures for financial products (SFDR RTS). Official Journal of the European Union.

³⁵⁷ European Parliament and Council (2019) Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector (SFDR). Official Journal of the European Union

threshold, referring to the portion of investments made to achieve environmental or social characteristics or sustainable investment objectives, as defined in the binding parts of the investment strategy and disclosed under the SFDR-related disclosure annexes. Simultaneously, funds must apply exclusion criteria referencing benchmark exclusions (Paris-aligned and Climate Transition Benchmark exclusions) according to the category of terms applied (European Commission, 2020)³⁵⁸. As a consequence, the term "ESG" is no longer just a positioning choice; it becomes a restriction on portfolio construction that must be maintained over time, monitored, and explained (European Securities and Markets Authority, 2024)³⁵⁹.

In at least three ways, this transforms the process of forming demand for sustainable debt issued by banks. First, it increases the value of those instruments that can be clearly classified and defended as contributing to the "80% bucket." In practical terms, managers wish to purchase securities that have documentation and characteristics that clearly align with their commitments to the binding strategy. A labelled bond with clear use-of-proceeds categories, transparent allocation reporting, and regular, post-issuance updates is easier to justify within the 80% threshold than a vague "transition" corporate narrative with limited traceability. This does not imply that unlabelled instruments cannot qualify; however, it does imply that labelled instruments can reduce the cost of justification; provided the label is credible.

Second, ESMA's exclusions introduce sectoral and controversial sensitivities that affect demand for issuers, particularly banks exposed to high-emitting sectors. If a fund must exclude exposures in accordance with benchmark methodologies, it may be necessary to avoid certain issuers or exposures, depending on how exclusion screens operate and how holdings are interpreted. In this type of environment, investors are more likely to pay attention not only to the label on the bond but also to the broader transition strategy and exposures of the issuing bank, because reputational and policy risks can migrate from portfolio construction into client relationships. A bank can issue a labelled bond; however, if its overall transition path is deemed inconsistent, ESG-labelled funds will think twice before purchasing, especially if their clients expect coherence across all holdings.

Third, ESMA regulations create real, observable market reactions that redirect capital flows. A characteristic of this regulatory regime is that it influences decisions about product names at a massive

³⁵⁸ European Commission (2020) Commission Delegated Regulation (EU) 2020/1818 of 17 July 2020 supplementing Regulation (EU) 2016/1011 as regards minimum standards for EU Climate Transition Benchmarks and EU Paris-aligned Benchmarks. Official Journal of the European Union.

³⁵⁹ European Securities and Markets Authority (ESMA) (2024) Guidelines on funds' names using ESG or sustainability-related terms (ESMA34-1592494965-657). Paris: ESMA.

scale. A large number of funds have renamed products or changed their investment policies to comply with the new rules, and this has second-order impacts on capital flows: renaming can lead to reduced demand from investors who use ESG terms as a search heuristic, while the tightening of investment policies can lead to increased demand for compliant securities, including credible bank-issued sustainable debt. ESMA has analysed the impact of the guidelines on fund name changes and net flows, and the broader research community has documented large-scale renaming activities in response to the new rules. The mechanism is consistent: regulatory pressure leads to changes in labels; labels lead to changes in distribution; distribution leads to changes in capital flows; capital flows lead to changes in what managers buy (European Securities and Markets Authority, 2025)³⁶⁰.

Finally, the guidelines also change the economic conditions surrounding verification. Under less stringent regimes, managers could justify holdings based on broad narratives. Under the ESMA naming discipline, managers must maintain measurable thresholds and exclusions "over the lifetime of the fund," and deviations must be treated as breaches requiring correction. This makes reliable classification and documentation more valuable. This also generates demand for issuers that provide better data, clearer reporting, and fewer ambiguities. The implication for banks is clear: labelled issuance is no longer merely about marketing to ESG investors; it is about being investible under product rules that are enforceable.

4.2.2 Portfolio Alignment vs. Real-World Decarbonization

A major challenge in sustainable finance is that portfolio alignment metrics typically improve much faster than the global economy's decarbonization rate. This occurs because financial institutions can adjust their portfolios more quickly than the real economy can adjust its production base. In other words, investors can move capital into low-carbon sectors or away from high-emitting sectors (or into companies that are already performing well relative to those metrics), and their reported alignment will improve without necessarily resulting in a commensurate decline in the amount of real-world emissions being financed. This is not a criticism of ethics; it is a fundamental property of capital markets that affects the kinds of things investors will ask banks to provide.

Banks may be subject to a particular form of pressure from this dynamic. As the interface between capital markets and the real economy, banks provide financing for companies through loans, facilitate the issuance of securities, and serve as a conduit for clients to engage in transition finance in carbon-

³⁶⁰ European Securities and Markets Authority (ESMA) (2025) TRV article: Impact of ESMA Guidelines on the use of ESG or sustainability-related terms in fund names (ESMA50-801628861-4423). Paris: ESMA, 17 December.

intensive sectors. If investors assess banks primarily based on the "optics" of portfolio alignment — e.g., the percentage of "green assets" or taxonomy-aligned exposures — then banks may have an incentive to optimize their disclosures and labelled issuance, rather than to promote the necessary transition finance to companies in carbon-intensive sectors. However, sophisticated institutional investors are beginning to recognize this and are starting to ask banks for evidence that they are facilitating transition in the real economy, such as credible transition plans, sector pathways, and client outcomes. That investors are making this request is evident in how net-zero frameworks are being implemented. Investor frameworks are focusing on reducing portfolio emissions and engaging with high-emitting sectors, establishing sectoral targets, and assessing the credibility of transition plans. The types of questions investors are now asking include:

1) Does the institution have a strategy for achieving absolute emissions reductions in financed portfolios? 2) Are there credible pathways with interim targets? 3) Does the institution support clients in transition, and if so, how?

These types of questions affect demand for bank-issued sustainable debt, as investors are concerned about the potential disconnect between the level of transition pursued by an institution and the level of transition reflected in the instrument-level label of an individual issue.

Additionally, the difference between portfolio alignment and the actual decarbonization of the real economy is influenced by data quality and the boundaries used to measure financed emissions. Measuring financed emissions requires methodology, data, and attribution assumptions. Institutional investors understand that two portfolios could be reported to have financed different amounts of emissions, not only because of differences in the activities they financed, but also because of differences in methodologies used and data quality. This results in a desire for standardization and auditable measures of financed emissions. Institutional investors are increasingly preferring to invest in banks that use established financial reporting standards and disclose the quality of their data and methodologies (Partnership for Carbon Accounting Financials (PCAF), 2022)³⁶¹.

Finally, the portfolio alignment vs. real economy decarbonization tension also has implications for the market's information hierarchy. The highest level of decision-making involves actions that result in material changes in the number of emissions produced in the real economy. Examples of these include lending terms that require clients to develop and implement transition plans, sustainability-

³⁶¹ Partnership for Carbon Accounting Financials (PCAF) (2022) The Global GHG Accounting and Reporting Standard for the Financial Industry: Part A (Financed Emissions), Second Edition. Amsterdam: PCAF.

linked loan products that contain credible key performance indicators and penalties, and financing that enables low-carbon capital expenditures. Lower down the hierarchy are the decisions that change the optics of a portfolio without necessarily changing the outcome, such as reallocations, exclusions, and label-heavy issuance that are not linked to additional transition activity. Institutional investors are increasingly trying to differentiate between these two types of decisions, as regulators are requiring them to justify sustainability-related claims.

In the context of the bank-issued sustainable debt market, the distinction between these two types of decisions manifests as investor preferences for issues tied to credible outcomes and governance. Investors are more likely to consider green bonds that finance specific eligible assets with transparent allocation reporting as representative of "real economy linkages" than generic sustainability narratives. However, investors are also evaluating the extent to which the financed assets represent new capacity, and whether they displace more carbon-intensive alternatives. Additionally, investors are scrutinizing whether the bank's overall lending strategy is consistent with the transition pathways outlined in the bank's own transition plan. Therefore, the demand signal for sustainable debt is becoming multi-dimensional: a credible instrument, a credible issuer, and a credible measurement ((GFANZ), 2022)³⁶².

Therefore, the market is transitioning from a simple "label premium" logic to a "coherence premium" logic. The greatest demand occurs when the label of the bond, the issuer's transition plan, and the bank's prudential disclosures and financed emissions accounting all point in the same direction. When these elements are inconsistent, investors experience greater reputational and mandate risk, and demand weakens. This is how investor demand functions as a discipline: not because investors are uniformly "green," but because investors are limited by what they can defend as decision useful (Paris Aligned Investment Initiative, 2024)³⁶³.

4.2.3 What Institutional Investors Now Expect from Banks

Asset owners, pension funds, sovereign funds, and insurers sit at the top of the capital chain, and their requirements increasingly define what "sustainable demand" actually means. Over the past few years, asset owners have translated climate commitments into operational procurement requirements for their managers. Managers then transmit those requirements to issuers through investment decisions,

³⁶² Glasgow Financial Alliance for Net Zero (GFANZ) (2022) Expectations for Real-economy Transition Plans. GFANZ, June/September editions.

³⁶³ Paris Aligned Investment Initiative (PAII) (2024) The Net Zero Investment Framework: Implementation guidance for investors (NZIF 2.0). Paris Aligned Investment Initiative (with investor networks including IIGCC).

engagement, and pricing. For European banks, this is the most important demand shift: the marginal investor is not only asking “is this bond green?” but “is this issuer transition-capable, measurable, and auditable?”

In practice, asset owner requirements now cluster into five areas. First is the transition plan's credibility. Asset owners increasingly expect banks to publish transition plans that include clear governance, sectoral priorities, interim targets, and implementation mechanisms. They want evidence that targets are embedded in strategy and risk management rather than being reputational aspirations (Transition Plan Taskforce, 2023)³⁶⁴. They also expect banks to explain how they will address high-emitting sectors: whether through engagement, conditional financing, or a managed phase-out, and how this approach aligns with science-based pathways. Second is the financing of emissions measurement and disclosure. Asset owners increasingly require banks to report financed emissions using established accounting methodologies and to disclose coverage, data quality, and the treatment of key sectors. They are aware that financed emissions are difficult to measure, but they treat transparency and methodological discipline as non-negotiable. Banks that cannot explain how emissions are measured, what is included and excluded, and how quality will improve face reduced credibility. The requirement is shifting from “show ambition” to “show measurement.” Third is evidence that sustainable finance activity is linked to real-economy outcomes. Asset owners increasingly want to see how banks use their balance sheets to drive transition: sustainable lending with credible covenants, sustainability-linked structures with meaningful KPIs, green project finance, and financing for enabling infrastructure. Crucially, they want these activities to be scalable and integrated, not isolated pilot projects. These shifts demand toward issuers that can demonstrate pipeline depth, governance discipline, and transparent reporting at scale. Fourth is governance and auditability. Asset owners are increasingly sensitive to greenwashing risk and want evidence that banks have internal controls, independent assurance processes, and data lineage. This is especially relevant for sustainable debt issuance, as asset owners are often long-term holders: if a controversy arises, they may bear reputational and performance consequences. Therefore, they prefer issuers whose sustainability claims are produced under governance systems that can withstand scrutiny. Fifth is alignment with regulatory and supervisory disclosure frameworks. In Europe, banks’ climate claims increasingly interact with prudential disclosures. Asset owners are beginning to use these disclosures as part of issuer assessment because they provide comparable, rule-based indicators. They also serve as a consistency check: if a bank aggressively markets sustainable issuance but its prudential indicators and transition disclosures reveal limited progress or major data gaps, asset

³⁶⁴ Transition Plan Taskforce (TPT) (2023) Disclosure Framework (October). London: TPT.

owners may view the sustainability narrative as weak. This increases demand for coherence across reporting channels.

These requirements are already influencing market dynamics. Asset owners and their managers increasingly differentiate between banks that have robust transition governance and measurement infrastructures and those that rely on high-level commitments. They also increasingly demand disclosure of how banks engage with clients, how sectoral targets are set, and how progress is tracked (Institutional Investors Group on Climate Change (IIGCC), 2023)³⁶⁵. In this environment, bank-issued sustainable debt becomes investable not simply because it is labelled, but because it is issued by institutions that can demonstrate transition capability in a measurable, comparable way. The conclusion is that asset owners are reshaping demand away from labels as marketing signals and toward them as evidence gateways. They are not abandoning sustainable finance; they are professionalising it. For European banks, this means the cost of capital advantage, where it exists, is increasingly reserved for issuers that can provide not only a labelled bond but a defensible, auditable story of how that bond fits into a coherent transition pathway (UN-convened Net-Zero Asset Owner Alliance, 2024)³⁶⁶. This is the investor-side mechanism through which “green” becomes decision-useful information.

1.6 The Cost of Greenwashing

Greenwashing is becoming "costly" when it ceases to be a reputational problem and becomes a risk factor that investors, regulators, and courts can price, punish, and disseminate throughout funding systems. The costs that arise in the European bank-issued sustainable debt market are not generated by a single mechanism (European Parliament and Council, 2023)³⁶⁷; rather, they represent the cumulative impact of four distinct mechanisms: (1) a revaluation of the perceived credibility of the firm's sustainability claims, (2) reduced access to limited pools of capital, (3) an elevated legal and disclosure risk profile, and (4) second-order effects during times of crisis, including volatility in spreads, risks of exclusion from indexes, and downward pressure on ratings through governance assessments. Therefore, the process of valuing the costs of greenwashing must extend beyond the

³⁶⁵ Institutional Investors Group on Climate Change (IIGCC) (2023) *Investor Expectations of Corporate Transition Plans: From A to Zero*. London: IIGCC, 15 March.

³⁶⁶ UN-convened Net-Zero Asset Owner Alliance (NZAOA) (2024) *Target-Setting Protocol: Fourth edition*. Geneva: UNEP FI / NZAOA.

³⁶⁷ European Parliament and Council (2023) Regulation (EU) 2023/2631 of the European Parliament and of the Council of 22 November 2023 on European green bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds. Official Journal of the European Union.

simple "greenium vs. no greenium" framework. The key question is how credibility shocks translate into a bank's funding curve, liquidity profile, and option sets.

The starting point is that there is an increasing amount of institutional infrastructure that operationalizes sustainability claims. Asset managers and asset owners cannot simply "trust" an ESG story; they must justify why they hold the securities (European Parliament and Council, 2019)³⁶⁸ (European Commission, 2022)³⁶⁹ in line with their investment products, customer mandates, and regulatory expectations regarding marketing and disclosure integrity in Europe. When an issuer's sustainability claim fails, it is not only a collapsed narrative; it is also a compliance object that has become disputed. This changes the investor response function: what would previously have been viewed as reputational noise is now interpreted as evidence of governance weaknesses, control issues, or mis-statements - each of which has a corresponding financial risk.

Banks are particularly vulnerable to overvaluing the costs of greenwashing because sustainable debt issuance is a common method for banks to diversify their investor bases and demonstrate transition credibility. Banks issue into a market where a significant proportion of demand is policy-constrained (real money, insurance companies, pension funds, ESG-labelled funds) and where the average holding period is long. When an issuer's credibility is damaged, these investors typically cannot quickly exit their positions without incurring tracking errors, reputational damage, or mandating inconsistency. As a result, they respond by tightening their due diligence, reducing their participation, demanding concessions or excluding the issuer from certain strategies. The result is not a single one-off spread movement, but a persistent deterioration in the issuer's marginal funding terms and access to funding.

There is a second reason banks experience heightened costs due to greenwashing allegations: their sustainability claims are assessed not only at the individual instrument level but also as part of their overall disclosures and prudential statements. Even if a particular bond was issued appropriately, a broader greenwashing accusation can influence views regarding an issuer's internal controls, data governance, and regulatory compliance. In Europe, supervisory authorities have established that climate governance is not a branding issue and that failure to comply with climate governance standards can prompt authorities to impose sanctions (European Central Bank (ECB), 2025)³⁷⁰.

³⁶⁸ European Parliament and Council (2019) Regulation (EU) 2019/2088 ... on sustainability-related disclosures in the financial services sector (SFDR). Official Journal of the European Union.

³⁶⁹ European Commission (2022) Commission Delegated Regulation (EU) 2022/1288 ... (SFDR RTS). Official Journal of the European Union.

³⁷⁰ European Central Bank (ECB) (2025) ECB imposes periodic penalty payments on ABANCA for failing to sufficiently identify climate risks. Press release, 10 November.

Investors learn from sanctioning activities: if authorities are willing to enforce sanctions, investors will rationally update their expected downside distribution of credibility risk.

For valuation purposes, the costs of greenwashing can be divided into three categories. The first category represents direct funding costs: spread widening on future labelled and unlabelled issuances, lower order book depth, and higher concession rates required to complete issuances in the market. The second category represents indirect costs: restrictions on the issuer's ability to issue in certain forms, higher liquidity reserves resulting from unstable market access, and increased dependence on alternative funding sources that may be more costly or less scalable. The third category represents contingent costs: legal settlement expenses, remediation programs, higher audit/assurance fees, and increased supervisory attention, which result in higher compliance and operational expenses.

It is important to note that the cost is non-linear. Minor inconsistencies may be absorbed; however, credibility shocks indicating governance failure may prompt abrupt investor responses because they cause the issuer to transition from a "trusted" to a "questioned" status. Once the issuer is "questioned," it has a higher burden of proof: future claims must be supported by more documentation, assurance, and investor interaction. This burden is economically meaningful because it increases transaction costs and reduces the speed of market entry - an overlooked mechanism by which greenwashing damages shareholder wealth.

Finally, the cost of greenwashing must be analysed dynamically. The risk of greenwashing is path-dependent: once a credibility issue is established as a benchmark, investors incorporate it into their screening heuristics. In markets characterized by mandates and defensibility, heuristics play a role. An issuer associated with exaggerated claims is more likely to be excluded by conservative compliance functions, regardless of whether subsequent disclosures improve. Therefore, the cost of greenwashing must be estimated using persistence: it is partially a "risk premium" that can persist after the original event. The following sections examine the major channels of transmission: volatility and access-to-funding effects; legal, disclosure, and prudential risks; and crisis communication, which can either stabilize or amplify losses (European Securities and Markets Authority, 2024)³⁷¹.

4.3.1 Spread Penalties and Funding Access

The first quantifiable evidence of greenwashing costs is a shift in how the market values the uncertainty associated with an issuer's sustainability claims. This manifests itself most clearly in fixed

³⁷¹ European Securities and Markets Authority (ESMA) (2024) Final Report on Greenwashing (ESMA36-287652198-2699). Paris: ESMA.

income as volatility in secondary spreads and higher concession rates at issuance. The process behind this is straightforward: while sustainable debt investors are purchasing the bank's credit risk, they are also purchasing "credibility risk." If the credibility of an issuer is called into question, the investor's expected loss distribution will expand beyond the banks' core solvency, and this expanding distribution can be expressed as either a spread penalty or as daily movements in spreads driven by news. Additionally, the expanded distribution can result in reduced liquidity.

Restrictive access to funds is critical to measuring the actual economic value of credibility. Banks with a strong reputation for their sustainability can attract a larger pool of investors, possibly increasing the likelihood of executing large issues and decreasing dependence on more costly forms of funding. Conversely, when an issuer loses credibility, access to funds is severely restricted due to the withdrawal of constrained investors. This is not limited to "green" investors; mainstream real-money investors view a failure of sustainability claims as a signal of poor risk-management practices. Failing sustainability claims may indicate an internal control deficiency: if the institution exaggerated what it could financially support, investors would infer a higher probability of unexpected events in other areas.

This phenomenon is exacerbated in Europe by mandates. A significant portion of sustainable debt demand is linked to products that must protect investments under ESG terminology and disclosure restrictions. When an issuer's labelled product issues become the subject of controversy, managers face a regulatory issue: can they continue to own these securities without fear of being challenged to justify that their ownership does not violate the stated sustainability profile of the fund in which they are held? For a risk-averse compliance group, the safest course of action is to reduce the amount owned. This reduction in demand is not hypothetical (DWS, 2025)³⁷²; it represents a rational response to an evolving regulatory climate in which both regulators and clients are increasingly prepared to dispute ESG claims made by an issuer. As such, the consequence for the issuer is a decrease in book depth and a shift in marginal buyers to price-sensitive buyers. This is precisely why new-issue concession rates rise: the issuer must sell through the market using less "sticky" demand.

Additionally, volatility increases when greenwashing allegations alter the information set used to price the issuer (Krüger, 2015)³⁷³. Previously viewed as credible, an issuer with a stable investor narrative and a governance premium would now have a broken investor narrative and be repriced based on a more pessimistic prior expectation. Investors will assume a higher probability of receiving additional negative information (further inconsistencies, restatements, supervisory intervention) and

³⁷² DWS (2025) DWS statement on the conclusion of the ESG investigation. Media release. Available at: DWS website

³⁷³ Krüger, P. (2015) 'Corporate goodness and shareholder wealth', *Journal of Financial Economics*, 115(2), pp. 304–329.

therefore expect wider spreads. This is another example of the uncertainty channel: when the probability of additional negative information increases, spreads can widen regardless of any cash flow implications.

As such, the penalty spread that results from the inability to sustain ESG claims is especially relevant in the sustainable finance space, since the market is increasingly able to distinguish between "labelled, but weak" and "labelled, and defensible" (staff, 2025)³⁷⁴. Although the average greenium estimate may be low, credibility shocks can eliminate any advantage and incur a penalty. In practice, this penalty can manifest as: (i) a higher new issue premium on subsequent labelled issues, (ii) reduced secondary performance compared to comparable conventional issues, and (iii) reduced participation from ESG-focused real money investors that typically provide tighter pricing. Ultimately, this can result in the issuer having a higher cost of capital over time, not only on green bonds, but across its entire yield curve due to the spillover effects of reputation damage.

Access to funding is also impacted over time and through market windows. When volatility increases, issuers become more dependent on favourable market conditions in order to execute large issues. A bank whose credibility is called into question may find it difficult to execute large transactions without paying a concession. This will result in an opportunity cost for the bank: it will lose its ability to opportunistically time the issuance of its issues. From a bank treasury perspective, opportunity cost is very real: flexibility reduces funding risk and, consequently, the need for precautionary liquidity buffers. Therefore, when flexibility is reduced, the institution may be required to maintain higher liquidity levels, incur higher costs, or be exposed to greater refinancing risks.

Another channel is the potential to alter index and benchmark eligibility. Many fixed-income investors rely on indexes or benchmark restrictions. If sustainability controversies lead to changes in classification, eligibility, or the definition of internal benchmarks, forced selling may occur, or at least incremental demand may be eliminated. Even if there is no formal restriction, internal risk limits may be tightened. These restrictions on demand will increase volatility and make the cost of greenwashing in fixed income more than just a one-time reputational damage, but rather a sustained increase in uncertainty and the loss of access to constrained demand pools that previously supported tighter execution.

Finally, volatility and restrictive access to funds affect are often self-reinforcing. Increased spreads produce negative headlines; negative headlines produce reduced sentiment; reduced sentiment produces less demand. To break this cycle, the issuer must demonstrate credible and effective remedies and communicate them clearly, as addressed in Chapter 12.3. The primary point here is that

³⁷⁴ Reuters (2025) 'Deutsche Bank-owned asset manager DWS fined €25 million for "greenwashing"', Reuters, 2 April.

the cost of greenwashing in fixed income is not merely the one-time reputational damage, but also the sustained increase in uncertainty and the loss of access to constrained-demand pools that previously provided tight execution.

4.3.2 Legal Risk and Disclosure Exposure

Greenwashing in the form of "cost 2" (credibility costs) arises when problems with credibility in the market migrate to the legal and supervisory domains. Credibility issues migrating into the legal and supervisory domain are becoming increasingly plausible in the European Union, as sustainability claims overlap multiple areas of law, e.g., financial reporting obligations, consumer protection and advertising regulations, as well as prudential regulation regarding the governance and risk management of banks. Legal risk is not only limited to the term "lie," but can also include misleading omission, insufficient substantiation of sustainability claims, lack of consistency in disclosures within a document or across different documents, as well as failure of the governance structure, which undermines the validity of the sustainability information disclosed to the public (European Securities and Markets Authority, 2024)³⁷⁵.

Disclosure risks are important, since a significant number of sustainability claims are typically made in formal documents (European Parliament and Council, 2017)³⁷⁶, e.g., framework documents, prospectus documents, annual report documents, impact report documents, and information formally disclosed under regulatory requirements. When the validity of the claims is challenged, the challenge is evaluated based on the formal documents used to make the claims, and the burden of proof is reversed. Thus, if an issuer has promoted itself as having implemented the most rigorous application of ESG principles, but the implementation of those principles was inconsistent internally, the difference between the two may be a potentially legally relevant fact. The extent of the increase in legal risk to issuers is exemplified by the growing use of enforcement and prosecutorial tools against issuers of financial instruments that have engaged in ESG misstatements. This example indicates that greenwashing can cause more than just damage to the issuer's reputation. The more cases that demonstrate the use of enforcement and prosecutorial tools, the higher the expected cost of legal compliance and, therefore, the lower the value of the issuer's shares.

³⁷⁵ European Securities and Markets Authority (ESMA) (2024) Final Report on Greenwashing (ESMA36-287652198-2699). Paris: ESMA.

³⁷⁶ European Parliament and Council (2017) Regulation (EU) 2017/1129 of the European Parliament and of the Council of 14 June 2017 on the prospectus to be published when securities are offered to the public or admitted to trading on a regulated market (Prospectus Regulation). Official Journal of the European Union.

The risk of legal liability is further heightened by the cross-border nature of sustainability finance. An issuer located in the European Union could be subject to investigations and/or enforcement actions by all competent national authorities, supervisory authorities at the European level, and internationally recognized regulatory agencies. Therefore, the failure of a sustainability claim could expose the issuer to jurisdictional liability in multiple jurisdictions. While the financial penalties imposed upon the issuer may be reasonable, the costs associated with the remedial activities required to restore the integrity of the issuer's sustainability-related disclosures could be substantial. Specifically, the remedial costs could include updates to the issuer's documentation systems; an independent review of the issuer's sustainability-related disclosures; redesign of the issuer's internal controls; and possible restatement of previously issued financial statements. These costs are economically material because they would likely divert management resources away from core business operations and impose operational constraints on the issuer at a time when investor confidence in the issuer's financial condition is already strained.

For banks, the most significant prudential channel for sustainability claim failures is the potential for prudential regulators to interpret such failures as evidence of weaknesses in the bank's governance and control functions. Governance is not simply a matter of bank discretion; it is a regulatory interest. Accordingly, prudential regulators may view the failure of a sustainability claim as evidence of a deficiency in the bank's risk management systems, data governance practices, or internal controls. Where prudential regulators interpret the failure of a sustainability claim as indicative of deficiencies in the bank's risk management systems, data governance practices, or internal controls, the regulator may take disciplinary action against the bank (European Central Bank, 2025)³⁷⁷, including requiring remediation, conducting more frequent examinations, and using enforcement tools. Although prudential regulators may not directly impose additional capital on the bank as a result of the failure of a sustainability claim, the regulatory pressure placed on the bank to improve its risk management systems, data governance practices, and internal controls will likely result in increased operational costs and decreased flexibility in terms of strategic decisions.

A critical point is that prudential implications can exist regardless of whether the greenwashing issue is considered "non-financial" in a narrow sense. Prudential regulators evaluate the bank's risk governance, internal controls, and management capabilities. If the bank's sustainability-related

³⁷⁷ European Central Bank (ECB) (2025) ECB imposes periodic penalty payments on ABANCA for failing to sufficiently identify climate risks. Press release, 10 November.

disclosures were found to be substantially inconsistent, the prudential regulator may question the management's ability to control more complex reporting domains.

As noted earlier, the reputational implications of a prudential regulator questioning management's ability to manage complex reporting domains are important because they can influence many aspects of a bank's strategic options, including approval processes and the intensity of ongoing oversight. Disclosure risks are also rising as the trend towards standardized sustainability reporting in Europe intensifies. As sustainability reporting becomes more structured and comparable, it is easier for third-party evaluators to identify inconsistencies in sustainability-related disclosures and thus to bring challenges against issuers. Consequently, the likelihood of legal action or regulatory enforcement against issuers is increasing. Moreover, the costs associated with legal liability are not limited to penalties paid. Issuers must expect to incur substantial costs in developing systems, obtaining assurance, and establishing governance procedures to ensure that their sustainability-related disclosures meet regulatory expectations. These expenditures are viewed by investors as reducing future profitability and thereby increasing the risk premium associated with investing in the issuer's equity.

Greenwashing-related risks can also affect the relationship between a bank and its clients and counterparties. Corporate clients may be reluctant to enter into label-based arrangements with banks that have faced controversy, because they fear reputational harm from association with the bank. Reduced participation by corporate clients in label-based arrangements will result in reduced fee income and weakened franchises for banks that offer sustainable finance products. Since franchise effects are strategically important in a competitive European banking industry, investors will price deteriorations in a bank's sustainable finance franchise as reductions in future growth opportunities. Lastly, disclosure risks are closely aligned with the coherence problem identified in the thesis. If a bank aggressively promotes labelled sustainable debt, while prudential disclosures, transition reporting, and financed emissions accounting provide little evidence of substantive progress or significant data gaps, then plaintiffs and regulators will be able to frame the bank's sustainability-related disclosures as misleading. The legal cost of greenwashing is therefore not solely based on the individual statement, but rather on the overall coherence of the bank's disclosure architecture. Coherent disclosure architectures reduce legal risk, whereas non-coherent disclosure architectures increase it. Therefore, valuation depends on whether the issuer's disclosure architecture functions as a controlled reporting system or a loose marketing ecosystem.

4.3.3 Communicating Through Sustainability Crises

When sustainability claims fail, the first cost to the organization is usually driven by the market (spreads, volatility, demand withdrawal). The second wave of cost to the organization is usually driven by legal and regulatory responses to the situation. The crisis communications function sits in the middle of these waves. While crisis communications will not alter the fundamental facts of the situation, it can materially influence the course of losses by shaping investor inferences. As such, in fixed-income markets, investor inference is a critical factor: investors are not only valuing today's issue; they are also valuing the likelihood of additional negative information and the issuer's ability to correct the problem. Thus, while the primary purpose of crisis communications is to protect reputation, it is an economic activity, not simply a reputational one.

A well-designed crisis communications response begins with understanding what investors need to see. Investors do not want generic apologies or vague statements about "doing better." They want a clear, verifiable explanation of what went wrong, what the issuer is doing to correct the problem, and what steps the issuer is taking to ensure it doesn't happen again. In other words, the crisis communications response must be decision-useful to the investor. To be decision-useful, the crisis communications response must include:

1. A clear description of the claim(s) that were made;
2. A definition of the scope of the affected securities or disclosures;
3. An explanation of the root cause of the problem (governance failure, data error, methodology flaw, oversight deficiency);
4. A remediation plan that includes timelines for completion; and
5. A description of the assurances and/or governance changes that will provide the basis for verifying the effectiveness of the remediation efforts.

The most damaging forms of communication during greenwashing crises tend to fall into one of two categories. First, there is the form of communication referred to as "minimizing" - treating the issue as nothing more than a misunderstanding or "noise" in the media. Minimizing creates increased investor scepticism because it suggests the organization lacks accountability. Second, there is the form of communication known as "over-correcting" - making broad, sweeping promises of change without establishing a structure or controls to measure success. Both forms of communication are discounted by investors because they view them as merely marketing tactics. The most effective way for organizations to preserve their credibility during crises is through disciplined transparency with measurable commitments.

In the European sustainable finance context, communication must align with the applicable rule stack. Since investors operate within regulatory and mandated parameters, they need to know whether their

holdings remain defensible. Therefore, the issuer must specifically advise investors regarding the compliance status of the subject instrument, the status of any allocation or impact reporting, and whether any prior disclosures need to be corrected. If the problem relates to methodology (e.g., an impact measurement change), the issuer must provide a reconciliation: what has changed, why, and how comparability will be maintained. If the issue relates to governance failures, the issuer must outline the internal control upgrades, including internal audit involvement, board oversight changes, enhancements to reviewer scope, and data lineage improvements. These are the "bite" factors investors seek.

Timing is important. Uncertainty related to a crisis costs the investor. The longer investors are uncertain, the more they will value worst-case scenarios. A rapid first response by the issuer can help stabilize investor sentiment by reducing uncertainty; it must be followed by specific disclosures. The most effective sequence for responding to a crisis is: (i) acknowledge immediately and contain the scope of the problem, (ii) provide short-term transparency on what is known and what is being investigated, (iii) establish a time-bound remediation plan, and (iv) periodically update investors on the progress of the remediation efforts using objective evidence rather than rhetoric (Coombs, 2007)³⁷⁸.

Communication coordination across various stakeholders is also important. Banks must communicate with investors, regulators, and credit rating agencies. While these stakeholders share common interests, each has different areas of focus. Regulators care about governance and control aspects of remediation; investors care about verifiability and access to future financing; credit rating agencies care about governance-related indicators of potential future financial impacts. Inconsistencies in messaging across stakeholder groups are very damaging to an organization's credibility because they imply that the organization is attempting to manage the crisis narrative rather than the facts. A single factual base is required for all stakeholder groups. The base must be the same in substance, but the emphasis on certain aspects may vary depending on the audience.

Another key principle is separating "the impact of facts" from "the impact on strategy." While investors may accept methodological errors if they perceive the organization's governance is improving, they are less accepting of signs that the organization's sustainability strategy is perfunctory. Therefore, the crisis communication process must demonstrate that sustainability is embedded in the organization's control environment. The organization should demonstrate governance escalation: board-level review, audit committee involvement, expanded third-party

³⁷⁸ Coombs, W.T. (2007) *Ongoing Crisis Communication: Planning, Managing, and Responding*. 2nd edn. Thousand Oaks, CA: SAGE Publications.

assurance, and incentive/accountability changes. This is where crisis communication connects to Chapter 10: Governance provides credibility to crisis communication (European Central Bank (ECB), 2020)³⁷⁹.

Finally, crisis communications should explicitly address the forward-looking credibility premium. The objective of crisis communications is to reduce the current period's spread widening and to re-establish access to demand pools that are currently constrained by ESG-labelled funds and asset owner mandates requiring defensibility. The best way to restore trust with these investors is to provide structured evidence: new frameworks, if needed; enhanced allocation reporting; robust reviewer assurances; and data lineage improvements that enable investors to verify claims. When organizations provide this type of evidence, crises can represent turning points for strengthening governance; when organizations do not, crises can result in persistent risk premiums.

In summary, communications during a greenwashing crisis represent a valuation lever because they influence the market's expectations of future negative information, remediation costs, and long-term access to capital. Organizations cannot "talk their way out," but they can either expedite the convergence of their sustainability programs back to defensibility or increase the uncertainty premium through ineffective disclosure, inconsistent messaging, or a lack of measurable actions.

Conclusion

When Does “Green” Become Decision-Useful Information?

This thesis began with a seemingly simple yet well-structured question: At what point does "green" go from a marketing term to something a decision-maker finds useful?

The European sustainable debt market provides an unambiguous response, but only once we remove illusions. "Green" does not become meaningful because it is well-meaning. "Green" does not gain credibility because everyone uses it. "Green" does not get funded because it is a morally appealing concept. It only becomes decision-useful when it survives institutional friction.

Europe has unintentionally created a multi-stage testing framework to assess the validity of sustainability claims. The EU Taxonomy creates boundaries. The EU Green Bond Standard creates standards of instrument integrity. SFDR and fund labeling rules establish product-level marketing standards. CSRD and ESRS create digital systems of corporate sustainability disclosures. Prudential

³⁷⁹ European Central Bank (ECB) (2020) Guide on climate-related and environmental risks: Supervisory expectations relating to risk management and disclosure. Frankfurt am Main: ECB Banking Supervision.

supervisory authorities use Pillar 3 ESG templates to link climate exposure to supervisory oversight. All of these regimes were developed for specific purposes. However, together they create an extensive framework that subjects environmental claims to examination from multiple perspectives. Thus, in such a system, narrative is not enough. Coherence is all that matters.

The empirical analysis substantiates the notion that the market currently operates in accordance with the above principles. The greenium is conditionally present. There is a greenium when credibility is coherent. There is no greenium and potentially a negative greenium when coherence is lost. Damage to reputation due to credibility shocks is not simply image harm; it translates into assessable funding consequences. It affects order books. It changes who buys. It expands bid-ask spreads. It limits optionality. It determines which companies are assigned by compliance departments. In this type of environment, greenwashing is not a communication error; it is a funding risk.

Thus, the result is not the demise of sustainable finance, but its maturity. Capital markets are not giving up on "green." They are making a "green" professional. Investors no longer compensate issuers based on aspirations; they compensate issuers based on architectures. Investors do not pay for labels; investors pay for defendability. Sustainable debt acts like financial data only when it behaves like financial data, standardizable, reconcilable, auditable, and interoperable.

The title question thus has an unequivocal response. "Green" stops being a marketing term when it can be correlated to taxonomy criteria and has evidence that can be retrieved; when it continues to be consistent with conservative climate metrics; when an independent reviewer's opinion can survive scrutiny as well as is not simply ceremonial in nature; when the disclosure is digitally traceable and can be compared; and when the claim does not fall apart when subject to either investor mandates or regulatory cross-checking. In other words, "green" ceases to be advertising language when it becomes institutionally coherent.

However, this conclusion contains a deeper implication. The line between marketing and information is not based on ethics. Rather, it is based on the system's design. Sustainability is progressively being converted from a narrative goal into structured evidence through Europe's expanding body of rules. Wherever the architecture supporting sustainability is solidified, credibility compounds. Wherever it is fractured, credibility disappears.

Therefore, the prospects of sustainable finance will not be determined by the number of bonds labelled as sustainable or by the amount of capital branded as sustainable. Rather, the future of eco-friendly finance will be determined by whether environmental claims can be replicated, reconciled, and reviewed.

The critical competitive advantage for issuers will not be the boldness of their sustainability story; it will be the strength of their reporting structure.

If sustainable finance succeeds in Europe, it will not have succeeded because markets became more idealistic. Rather, if sustainable finance succeeds in Europe, it will have succeeded because sustainability became measurable, comparable, and enforceable.

At that point, "green" will no longer be a label.

It will be a classification.

Appendix A: Regulatory architecture and interoperability

Policy & regulation: closing the gaps

The European Union's sustainable finance environment is now entering the "gap-closure" stage. The primary concern is no longer the lack of sustainability terminology, but rather the presence of many separate, parallel rule systems that can describe the same financing activity using differing (and often conflicting) terminology. The key issue is that green labelling should be more than just a marketing term; it needs to be decision-useful information. Only a claim that maintains consistency across all the major layers of verification available to investors, supervisors, and auditors (instrument documentation/reporting; taxonomy classification; prudential disclosure for banks; and structured digital reporting) becomes decision-useful information.

Investors and their compliance departments will not only want to know whether a bond "sounds green," but also whether the claim of green is consistent enough to withstand cross-checking. At the policy level, the EU has established an "evidence stack" of disclosures, each one with a distinct function in verifying environmental claims. The EU Green Bond Standard provides a legally defined pathway for a bond issuer to obtain a high-integrity green label tied to the EU Taxonomy and supervised by standardized review templates (European Parliament and Council, 2023)³⁸⁰. Reporting under the Taxonomy and disclosing under Article 8 (European Commission, 2021)³⁸¹ of the Sustainable Finance Disclosure Regulation provides the classification and disclosure framework for "environmentally sustainable activities" (European Parliament and Council, 2020)³⁸². The Pillar 3 ESG reporting templates for banks provide comparable, recurring, and balance-sheet-anchored metrics that allow market participants to assess whether the bank's sustainability narrative is consistent with its exposure and risk management practices. The CSRD/ESRS reporting standards for non-financial corporations aim to standardize sustainability reporting and ultimately convert those reports into machine-readable disclosure objects (European Parliament and Council, 2022)³⁸³.

There are gaps in the current disclosure frameworks because they were developed for different purposes. Market-based disclosure standards, such as ICMA's Principles, were developed to promote

³⁸⁰ European Parliament and Council (2023) Regulation (EU) 2023/2631 of 22 November 2023 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds. Official Journal of the European Union.

³⁸¹ European Commission (2021) Commission Delegated Regulation (EU) 2021/2178 supplementing Regulation (EU) 2020/852 as regards Article 8 disclosures. Official Journal of the European Union, L 443, 10 December.

³⁸² European Parliament and Council (2020) Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment. Official Journal of the European Union, L 198, 22 June.

³⁸³ European Parliament and Council (2022) Directive (EU) 2022/2464 as regards corporate sustainability reporting (CSRD). Official Journal of the European Union, L 322, 16 December.

transaction discipline and global uniformity of process, not to define a singular taxonomy. The EU Taxonomy was developed to define what constitutes an environmentally sustainable activity, but it is data-intensive and difficult to interpret, resulting in usability issues and incentives to oversimplify. Prudential regulations were developed to make banks comparable and to facilitate supervision; they are not intended to “tell a story”. But to provide structured disclosure that can be reviewed by supervisors and the markets. Corporate reporting standards were developed to provide comparable and harmonized disclosure of material risks and impacts, but converting narrative to audited, tagged information requires time and infrastructure.

As a result, the "gap-closure" policy phase will primarily address interoperability and auditability. Interoperability means that a bank should not be able to claim high integrity "green" treatment under bond documentation and present a materially different view of its green status through taxonomy reporting or prudential disclosures. Auditability means that the underlying data used to support a green claim should be traceable, governed, and increasingly digitized, enabling assurance providers and sophisticated investors to verify its accuracy at lower cost. Once both goals are met, greenwashing will become a less attractive option for issuers, not because it is inherently immoral (it never has been), but because it becomes operationally unsustainable and legally risky in a system where multiple cross-checks can occur.

This policy phase is emerging now because regulators and advisory bodies have publicly acknowledged the usability and data limitations associated with the taxonomies and reporting stack. Policy cannot simply add additional disclosure requirements if the data limitations and complexities inherent in the stack generate noise, varying degrees of implementation, and increasing compliance costs. As a result, policy is shifting towards promoting greater coherence: simplifying areas where complexity does not create sufficient decision value and reinforcing areas of the stack that generate credible enforcement and comparability. This is also why the regulatory trajectory is increasingly focused on governance, controls, and supervised verification functions: the goal is to ensure that the reporting system produces verifiable evidence, and not simply more pages.

In summary, "closing the gaps" refers to the institutional mechanisms that transform sustainability from a narrative to evidence. Closing the gaps represents the transition from a reporting regime that can be viewed as marketing to one that behaves more like financial reporting: standardized, comparable, auditable, and increasingly digital. The remainder is to operationalize the idea of closing the gaps: first by illustrating how ICMA-EuGBS-Taxonomy can work together in an interoperable

manner; second by showing how Pillar 3 reporting templates represent evidence that can be used to defend bank ESG claims; and third by detailing the assurance and digital tagging infrastructure that will increasingly determine if a sustainability claim can be substantiated.

Aligning Standards Across the Market

Interoperability is not just a catchphrase. It's the actual engineering work necessary to make sure "green" means the same thing whether you're talking about disclosures across regimes or from one disclosure platform to another. In European debt markets, particularly those involving banks, the same funding event can be explained using at least three paradigms: An ICMA-style bond framework and reporting process, a taxonomy categorization paradigm (including the Article 8 disclosure paradigm); and, if the issuer wants to be designated as a EuGB issuer, a regulatory paradigm with specific template mandates and reviewed by third-party auditors. The goal of policy is to close down the opportunity for an issuer to be technically compliant within one paradigm, while creating a material difference in the presentation of verifiability in another.

The ICMA Green Bond Principles (International Capital Market Association, 2021)³⁸⁴ have been the global default for a number of years because they resolved a market coordination problem. Investors wanted a common way to assess claims about the use of proceeds. Issuers wanted the flexibility to finance multiple asset types across different jurisdictions. Therefore, the Principles emphasize the integrity of the process (International Capital Market Association, 2022)³⁸⁵: i.e., how do you select your projects, track your proceeds, and report? The principles do not provide a single definition of what is "green." Because of this design choice, ICMA has been able to scale globally, but it has also created a boundary: being aligned with the principles does not necessarily mean that the funded activities comply with the EU's technical screening criteria, DNSH requirements, or minimum safeguards requirements.

In Europe, the taxonomy-related regulations are a potential source of inconsistency with regard to the boundary established above.

The EuGBS regime specifically addresses this issue by establishing a direct relationship between the "designated as a European Green Bond" designation and the expectation that it is based on taxonomy alignment, and by establishing standard disclosures and the use of supervised external reviewers. The EuGBS regime is not simply a labelling enhancement: it is a mechanism for interoperability. It

³⁸⁴ International Capital Market Association (ICMA) (2021) Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds. Zurich: ICMA.

³⁸⁵ International Capital Market Association (ICMA) (2022) Handbook – Harmonised Framework for Impact Reporting. Zurich: ICMA.

provides a "gold standard" reference point against which investors can measure bonds, and it compels issuers that choose to designate their bonds as "EuGBS Designated" to develop internal capabilities for taxonomy mapping, for tracking allocations, and for reporting in a structured format. Additionally, it is now recognized that reviewers are not solely market-based entities; they are part of a supervised environment that enhances the credibility of the reviewer function and reduces information asymmetry.

However, interoperability cannot be achieved solely by modifying existing frameworks. It requires a "crosswalk" that aligns categories, criteria, and evidence. At the operational level, the best approach for achieving interoperability is to view the bond framework as a mapping interface. Each eligible category should be directly associated with the relevant taxonomy objective and technical screening criteria, where applicable, and the issuer should indicate the evidence needed to demonstrate alignment. This is important because taxonomy alignment is not a narrative claim; it is a test that typically requires asset-specific data, capex/opex linkage, and DNSH and minimum safeguards testing. Without a crosswalk, the issuer may create two separate systems: one that generates a story about the bond and another that generates taxonomy reporting. The danger is that the two systems do not diverge marginally but diverge substantially over time due to evolving criteria, shifting interpretations, or differing applications of rules across business units.

It is acknowledged that Europe's own policy apparatus recognizes the challenges inherent in developing a coherent system. The creation of Commission Delegated Acts and continuing revisions to taxonomy reporting requirements demonstrate that the taxonomy framework is technically challenging and operationally expensive (Platform on Sustainable Finance, 2022)³⁸⁶. Advisory work related to the simplification of taxonomy reporting involves a policy trade-off: maintaining integrity while creating a reporting system that is sufficiently usable to generate decision-value rather than compliance noise. Interoperability is the point at which these competing interests are reconciled: if the taxonomy rules are overly complex to apply consistently, issuers will either underreport, use proxy measures, or create discrete interpretations of the rules. The fragmentation of the taxonomy rules then makes it difficult for investors to compare and trust "green" claims among issuers.

To address this challenge, it is necessary to establish standardized interoperability practices and limit the degree of interpretive discretion available to stakeholders. This is why supervised external

³⁸⁶ Platform on Sustainable Finance (2022) Report on the Usability of the EU Taxonomy. Brussels: European Commission.

reviewers under the EuGBS (International Platform on Sustainable Finance, 2022)³⁸⁷ regime are critical, and why there is growing momentum behind global initiatives for taxonomy interoperability: they seek to define principles for comparing different taxonomies and standards, without devolving to lowest-common-denominator greenwashing. Taxonomy interoperability does not require all taxonomies to be identical; it requires transparent mapping logic, consistent definitions, and disclosure of methodological limitations. From an investor perspective, the benefits of interoperability are not philosophical; they are financial. Verification costs decrease when the mapping is explicit and stable, and the likelihood of credibility shocks is decreased when the claims are resilient across reporting layers.

Furthermore, interoperability will alter the capital-allocation incentives of investment managers. When investment managers must articulate holdings within the context of sustainability-product constraints, simpler-to-classify and defend instruments will increase in value. Bonds structured under a high-integrity regime, with taxonomy mapping and standard templates, will reduce the investment manager's internal compliance costs and, in turn, potentially increase demand and favorable pricing for the issuer. On the other hand, weak interoperability will increase the risk that holdings will become "difficult to defend," thereby shrinking the pool of eligible investors, even though the issuer's underlying credit is strong.

Finally, interoperability is increasingly becoming a lifecycle requirement, rather than a one-time issuance requirement. If a taxonomy criterion changes or if an issuer modifies its methodology, the issuer must be able to explain how this impacts allocation and reporting over time. To achieve this, the issuer must be able to version its methodology, document its data lineage, and ultimately implement digital reporting platforms. As such, the interoperability frontier is merging with digital auditability: the greater the extent to which disclosures become structured and searchable, the lower the tolerance for manual, narrative reconciliation.

In conclusion, interoperability is the technical bridge that converts "green" from a marketing label to a stable classification and evidence system. The policy agenda is not to replace ICMA market practices, but to ensure that ICMA market practices can be coherently mapped to taxonomy and EuGBS structures, and that supervised verification functions can reduce the space for inconsistent claims. Where that coherence exists, investors can treat "green" as decision-useful; where it does not, the label remains a narrative at risk of challenge.

³⁸⁷ International Platform on Sustainable Finance (2021) Common Ground Taxonomy – Climate Mitigation. Brussels: European Commission.

Making Sustainability Data Decision-Useful

There are many reasons why some investors continue to invest in companies that have significant negative environmental impacts, including their own companies' carbon footprints, pollution, habitat destruction, etc., even if these same companies also have initiatives and programs aimed at mitigating the harm caused by their business operations. However, many other factors could lead investors to avoid investing in such companies. For example, environmental issues such as climate change, water pollution, and biodiversity loss could negatively affect a company's bottom line, now or in the future, and thus deter investors seeking to generate positive returns on investment. There are also moral and ethical considerations. Some investors believe that businesses should be responsible stewards of natural resources and work to minimize the harm that their activities cause. Additionally, there may be legal obligations or government regulations that require certain investments to be made based on environmental concerns (e.g., pension funds). Another factor that could discourage investment is that investors are concerned about "greenwashing": the act of exaggerating a company's environmental practices and may therefore choose to avoid investing in companies that appear to be "greenwashing." While greenwashing itself is not illegal, it can erode investor trust and confidence in a company's overall practices and reputation, thereby discouraging investment.

To combat greenwashing, the European Union implemented mandatory disclosure requirements for large, publicly traded companies. Under this regulation, companies are required to publish regular reports on their Environmental, Social, and Governance (ESG) performance. Specifically, banks are required to report on their environmental and social risks under the European Union's Capital Requirements Regulation (CRR) (European Parliament and Council, 2019)³⁸⁸ using standardized templates designed by the European Banking Authority (European Commission, 2022)³⁸⁹. These templates help ensure consistency and comparability in reporting, making it easier for investors to evaluate the environmental and social risks across different banks.

This template-based approach to ESG reporting helps prevent greenwashing in three primary ways: First, the templates require companies to report on specific environmental and social risks. By providing a consistent and transparent way for investors to assess a bank's environmental and social risks, the templates make it more difficult for companies to hide behind vague or misleading statements about their environmental or social performance.

³⁸⁸ European Parliament and Council (2019) Regulation (EU) 2019/876 amending Regulation (EU) No 575/2013 (CRR II). Official Journal of the European Union, L 150, 7 June.

³⁸⁹ European Commission (2022) Commission Implementing Regulation (EU) 2022/2453 laying down implementing technical standards on prudential disclosures on ESG risks under Article 449a CRR. Official Journal of the European Union, L 324, 19 December.

Second, the templates encourage organizational integration by requiring banks to establish common data and control systems for managing their environmental and social risks. Third, the templates interact with regulators' expectations regarding banks' climate risk management practices. Regulators expect banks to integrate environmental and social risks into their internal risk management practices and for those practices to inform their external disclosures (Basel Committee on Banking Supervision, 2022)³⁹⁰. By linking the regulators' expectations for internal practice to the external disclosures, the templates provide a mechanism for investors to monitor compliance with those expectations.

Finally, the templates reduce investors' costs of scrutinizing companies' ESG performance by providing a comparable basis for evaluating it. Overall, the use of templates for ESG reporting provides a disciplined approach to assessing and disclosing environmental and social performance, helping increase the credibility of companies' environmental and social claims. It is worth noting that while the templates help to address some forms of greenwashing, they are unlikely to eliminate all types of greenwashing. Companies will likely continue to find new ways to manipulate their disclosures to create the impression of a stronger environmental or social commitment than exists. As such, the templates should be viewed as part of a broader strategy to increase the credibility of environmental and social claims and discourage greenwashing.

For example, in March 2019, the European Banking Authority published guidelines for implementing the capital requirements regulation (CRR) ESG disclosure requirements. The guidelines provided further clarity on disclosure requirements and were intended to facilitate the publication of high-quality, comparable disclosures.

These guidelines included recommendations for the content and presentation of the disclosures. The guidelines specifically emphasized the importance of consistency and comparability in the disclosure of ESG risks and opportunities and encouraged banks to report using standardized templates to achieve these goals. The guidelines also recommended that banks include explanations of any material differences in their disclosures from prior periods, and that they explain the methodology used to identify and estimate ESG risks and opportunities. While the guidelines were voluntary, they provided a clear understanding of the regulators' expectations and encouraged banks to improve the quality and comparability of their disclosures. As of 2022, a number of banks had reported their ESG-

³⁹⁰ Basel Committee on Banking Supervision (2022) Principles for the effective management and supervision of climate-related financial risks. Basel: BIS.

related disclosures under the CRR, although the quality and comparability of these disclosures varied significantly.

According to the European Banking Authority, the first wave of ESG Pillar 3 (European Banking Authority, 2022)³⁹¹ disclosures was triggered by the implementing regulation and related standards. The resulting disclosures created a comparable dataset that did not exist before. Early observations across banks showed varying levels of maturity: differences in coverage, methodological transparency, and integration with risk governance. Those differences are not abstract: they affect how credible investor's view sustainability claims. A bank with solid Pillar 3 disclosures can more credibly claim that sustainable issuance is integrated into institutional controls. A bank with weak or opaque Pillar 3 disclosures can still issue labelled debt, but investors will have greater uncertainty about the coherence of the claim.

Therefore, policymakers should treat Pillar 3 disclosures as a foundational layer of Europe's sustainable finance evidence stack. They cannot substitute for instrument-level reporting, but they can confirm that instrument-level claims are embedded in a governed system. The more the market relies on Pillar 3 as a check, the more issuers will be motivated to develop internal data and governance structures that support consistency. This represents a direct form of "closing the gaps": narrowing the space for sustainability narratives to diverge from a bank's prudential reality.

Digital Auditability and the Future of Sustainable Reporting

Interoperability and prudential templates deal with the "what" gaps. Assurance and digital auditing of data address the "how do we prove it?" gap. Sustainability reporting is starting to operate more like financial reporting, not because sustainability reporting is the same thing as financial reporting, but because capital markets need evidence of sustainability claims that are repeated and verifiable, and there needs to be clear accountability for false claims. This is significant for the thesis. "Green" reporting is no longer just marketing when it is both traceable, assurance-ready, and digitally comparable, allowing investors to use "green" reports to inform investment decisions without incurring the high costs of verifying the claims.

The assurance pillar is developing rapidly. Standards for traditional assurance (e.g., ISAE 3000) provided a broad-based framework for assurance engagements beyond audits of historical financial

³⁹¹ European Banking Authority (2022) Final draft Implementing Technical Standards on prudential disclosures on ESG risks. Paris: EBA.

information. However, given the rapid growth of assurance for sustainability reporting, a new, global standard is needed that is specific to sustainability reporting, including differences in subject matter, criteria, and available evidence. Therefore, the IAASB's release of ISSA 5000 (International Auditing and Assurance Standards Board, 2024)³⁹² is a structural development. It represents a movement toward consistent sustainability assurance standards across jurisdictions; provides clarity to assurance providers regarding how to apply assurance principles to sustainability reporting; establishes expectations related to assurance provider performance (i.e., quality of engagement); and indicates an important shift from voluntary best practices toward a formally established and timely standard that companies and assurance providers must implement.

However, assurance quality is limited by the quality of the underlying data infrastructure. What is unreliable to ensure that it cannot be traced? Hence, the digitalization agenda is not merely a cosmetic reporting initiative; it is a critical technology enabling auditable sustainability claims. The EU's approach through CSRD/ESRS (Corporate Sustainability Reporting Directive/European Sustainability Reporting Standards) and digital tagging aims to enable sustainability reports to be machine-readable and comparable. ESRS (European Commission, 2023)³⁹³ creates a detailed disclosure structure; digital taxonomies create the tags that convert the disclosed data into structured data; and the electronic reporting format agenda (ESEF and its sustainability extensions) creates a standardized reporting format for where the tagged data is reported. Tagged sustainability information enables investors, regulators, and data vendors to easily compare disclosed data across firms and identify inconsistencies in the data. This, in turn, increases the cost of greenwashing, as weak claims become more identifiable and therefore harder to justify.

Therefore, EFRAG's (European Financial Reporting Advisory Group) development of XBRL taxonomies (EFRAG, 2024)³⁹⁴ is central to this effort, this taxonomy is a data dictionary that allows each disclosure datapoint to be consistently tagged across issuers. The handoff of proposed ESRS and Article 8 taxonomies to the European Commission and ESMA reflects a pipeline: the standard setters determine what disclosures must occur; the taxonomy determines how to tag the disclosures in a machine-readable format; and the regulatory authorities determine the technical specifications and

³⁹² International Auditing and Assurance Standards Board (IAASB) (2024) International Standard on Sustainability Assurance (ISSA) 5000. New York: IFAC.

³⁹³ European Commission (2023) Commission Delegated Regulation (EU) 2023/2772 establishing ESRS. Official Journal of the European Union, L 2772, 22 December.

³⁹⁴ EFRAG (2024) ESRS Set 1 XBRL Taxonomy. Brussels: EFRAG.

markup for filing the tagged data. ESMA's (European Securities and Markets Authority, 2024)³⁹⁵ consultation on the application of electronic formats to sustainability reporting is part of this "close the gaps" infrastructure. ESMA recognizes that sustainability reporting is evolving as a type of capital market information object that should be comparable, accessible, and usable, the very definition of decision-useful information.

One implication of this infrastructure for sustainable debt markets is that investors will evaluate bond-level claims against enterprise-level, digitally accessible disclosures. Even though bond-level reporting may not be entirely digitalized, the issuer's sustainability reporting will be. Investors will employ a process of triangulation: if a bank asserts that sustainable issuance is financing taxonomy-aligned activities, does the bank have a taxonomy and sustainability reporting data infrastructure that supports the assertion and can be reconciled over time? If not, the bank-issued debt may be viewed as having higher "credibility risk," regardless of the credit risk associated with the debt. In other words, digital auditability will become a factor in the price of green claims.

Assurance also becomes more valuable as its scope and limitations become more transparent. Sustainable finance has historically been plagued by "assurance ambiguity." This occurs when investors misinterpret limited reviews as providing assurance of the actual results. A mature assurance environment eliminates that ambiguity: it clearly communicates whether the engagement provides limited or reasonable assurance, what criteria were applied, what evidence was reviewed, and what was outside the scope of review. As sustainability reporting becomes more structured under ESRS, assurance providers will be able to base their procedures on defined data points and criteria rather than relying on unique issuer narratives. That increases comparability and limits the extent to which issuers can hide behind greenwashing claims.

Additionally, a global convergence element reinforces the EU's position. IOSCO's endorsement of the ISSB standards (International Organization of Securities Commissions, 2023)³⁹⁶ establishes a global baseline for sustainability-related financial disclosures, enhancing the comparability of sustainability information across capital markets. While the EU's ESRS regime is not identical to the ISSB, global baselines enhance the ability to reduce fragmentation and facilitate comparative analysis

³⁹⁵ European Securities and Markets Authority (2024) Consultation Paper on amendments to ESEF RTS regarding sustainability reporting. Paris: ESMA.

³⁹⁶ International Organization of Securities Commissions (2023) IOSCO endorses ISSB Standards. Madrid: IOSCO.

by cross-border investors. Practically, as global disclosure frameworks converge, it becomes more difficult for issuers to present disparate, jurisdictionally inconsistent stories.

Finally, assurance and digitalization change the dynamics of enforcement. Structured and assured sustainability disclosures facilitate the documentation of misstatements and enable issuers to measurably track remedial actions: issuers can update tagged datapoints, report restatements, and illustrate enhanced control processes. This transforms sustainability governance into similar forms of financial reporting governance: controllable, testable, and therefore enforceable. That is precisely the system design that converts "green" from marketing jargon into a decision-useful market infrastructure.

To summarize, assurance standards and digital auditability represent the "endgame" of the EU's credibility stack. Interoperability harmonizes definitions and reporting layers; prudential templates link disclosures to controlled banking systems; assurance standards define verification; and digital tagging facilitates scalable verification and low-cost comparison. Collectively, these close the gaps that previously enabled ESG claims to serve as narrative marketing rather than as defensible information.

Appendix B: Issuer implementation framework

Issuer guide to staying in the white space: not in the Grey Zone

The "issuer white space" in European sustainable debt is a narrow band of operability within which a green, social, sustainability, or sustainability-linked claim can withstand the simultaneous effects of three stressors: investor mandate defensibility, regulatory cross-checking, and audit-grade traceability. The main difference driving this Chapter is that labelled issuance is no longer evaluated based on the qualitative nature of the narrative or the issuer's good intentions; it will be evaluated on the operational replicability of the claim. In practical terms, remaining in the white space means designing sustainable debt as a controlled reporting product (rather than a marketing product): the issuer must be able to describe the claim, demonstrate the chain of evidence supporting it, and maintain consistency with evolving definitions, templates, and data expectations.

Banks have a particular interest in this area, as sustainable debt is commonly used as a strategic funding mechanism: it increases the diversity of the investor base, enhances the stability of demand during bookbuilding, and communicates transition credibility. However, as banks are generally issuing into rule-bound demand pools (ESG-labelled funds, long-only real money, insurers, and asset owners that have articulated specific climate requirements), the downsides associated with failed

claims are non-linear. The negative consequences of a failed claim do not remain confined to the bond itself; rather, they spill over into the issuer's governance story. At this point, investors typically categorize the issuer from "defensible in the marketplace" to "difficult to defend", and the costs are not solely related to spreads, but also include execution friction, diminished book quality, and increased due diligence burdens associated with all future deals.

The white space approach starts with a simple design principle: each sustainability claim must have an "evidence twin." If the public-facing statement indicates the bond finances assets that align with the Taxonomy, the issuer must have a mapping file showing which assets, which criteria, which data fields, and which minimum safeguards or DNSH checks were used (European Commission, 2021)³⁹⁷. If the statement indicates "impact," the issuer must be able to reproduce the calculation of that impact using previously stored inputs and documented methodologies (including how baseline assumptions were established and how methodology changes are versioned across reporting years). If the statement indicates "third-party verification," the issuer must be able to document what the third-party reviewer reviewed, what was excluded from the scope of the review, and how the findings influenced the issuer's governance-based remediation efforts. At this point, "green" ceases to be a label and becomes decision-useful information: the claim is believable because it is verifiable, not because it is appealing.

The layered European regulatory environment drives issuers in this direction by establishing multiple "cross-check points". At the instrument level, the market expects a bond framework, an allocation report, an impact report, and an external review. At the level of taxonomy, EU-compliant claims establish technical screening criteria, DNSH, and minimum safeguards logic that can be verified. At the prudential level for banks, the Pillar 3 ESG template provides a comparative, recurring, and balance-sheet-anchored way for a bank to communicate its position relative to climate and taxonomy. At the corporate reporting level, the standardization of reporting under CSRD/ESRS and the ability to digitally tag inconsistencies make it easier to identify them.

As such, the issuer's "playbook" in this chapter is intentionally operational and not rhetorical. As such, it considers a labelled bond to be a governed workflow, encompassing policy definitions, eligibility decisions, treasury allocation controls, data warehouse architecture, assurance scope, and public reporting output. When these components are integrated, the issuer will remain in the white space as standards evolve, as the claim is tied to internal control processes and traceability rather than to changing marketing terminology. When these components are not integrated, the issuer will drift

³⁹⁷ European Commission (2021) Commission Delegated Regulation (EU) 2021/2139 supplementing Regulation (EU) 2020/852 by establishing the technical screening criteria for climate change mitigation and climate change adaptation. Official Journal of the European Union.

towards the grey zone, often unintentionally, because separate teams (treasury, sustainability, risk, finance, and investor relations) create mutually inconsistent versions of "the truth", and the claim made in the bond represents one of the easiest places for that inconsistency to emerge.

In summary, staying in the white space is not about always attempting to achieve the highest label rating; it is about creating a repeatable issuance and reporting process where (i) the claim is clearly defined, (ii) the evidence needed to substantiate the claim is specified at the outset, (iii) third party verification is informative rather than ceremonial, and (iv) the claim remains consistent with the issuer's Pillar 3 reporting and other regulatory disclosure obligations (European Parliament and Council, 2020)³⁹⁸. The next section operationalizes that playbook in relation to three issuer decisions: developing credible frameworks and third-party verification (14.1), ensuring that claims made in bonds are consistent with prudential climate KPIs (14.2), and developing impact metrics that can withstand scrutiny as assurance expectations and digital reporting become tighter (European Parliament and Council, 2023)³⁹⁹ (International Auditing and Assurance Standards Board (IAASB), 2024)⁴⁰⁰(14.3).

Designing Credible Frameworks from the Start

A viable, long-term, sustainable debt framework is a control surface and not simply a document. It is the issuer's primary public interface to its internal decision-making processes – namely, what may be financed, how it qualifies for financing, how the proceeds are monitored and recorded, and how the results of financing are documented. Credibility is lost in practice primarily because the issuer is unable to demonstrate, through evidence, that the actions taken by the issuer match those stated in the framework, or to provide such evidence as the number of reporting periods increases. Thus, the first step in developing a white space framework is to develop the claim in a manner that facilitates verification; consequently, the framework will need to articulate the operational standards and data requirements for translating ambitions into measurable criteria.

Within the European markets, there is an expected standard of conduct for the use of proceeds instruments that includes: clearly articulated eligible categories; a formalized project evaluation and selection process; procedures for managing proceeds; and commitments regarding reporting. These

³⁹⁸ European Parliament and Council (2023) Regulation (EU) 2023/2631 on European green bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds. Official Journal of the European Union.

³⁹⁹ European Parliament and Council (2023) Regulation (EU) 2023/2631 on European green bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds. Official Journal of the European Union.

⁴⁰⁰ International Auditing and Assurance Standards Board (IAASB) (2024) ISSA 5000: General Requirements for Sustainability Assurance Engagements (final standard, issued 2024).

elements are not merely cosmetic; they represent the minimum structural requirements to prevent proceeds from becoming "unaccounted" and to ensure the impact is demonstrable and verifiable. In the case of a bank, the framework will also need to define where the authority to make eligibility determinations reside within the organization, specifically: which committees define the parameters for the eligible categories; who has authority to approve borderline cases; which department/office is responsible for validating the completeness of the data submitted; and, how the determination of eligibility is correlated with both risk and financial data. If the framework does not explicitly outline these governance anchor points, it will likely result in a lack of coordination: the treasury team will optimize execution, while the sustainability team will optimize ambition, and neither will be responsible for ensuring the evidential reconciliation of these disparate activities.

The issuer must next design the evidence file prior to issuing the instrument(s). For each eligible category, the framework should detail what constitutes acceptable evidence and what does not. For example, if "energy efficiency" is an eligible category, the issuer would need to describe the threshold for determining whether a project meets the definition of "energy efficiency," and whether that threshold is based on the European Union's Technical Standards for Taxonomy Alignment or another recognized technical standard. Additionally, the issuer would need to detail how the performance of projects meeting the definition of "energy efficiency" would be evaluated, and what documentation would be maintained to support the evaluation. Similarly, if "renewable energy" is an eligible category, the issuer would need to describe whether refinancing of renewable energy projects is permitted; how commissioning dates for renewable energy projects are treated; and how exclusions of certain renewable energy technologies are addressed. The key here is not perfection; rather, the key is reproducibility. While investors may accept different methodologies across issuers, investors will not accept ambiguity that prevents them from testing a claim.

Independent verification is the second component of a viable, long-term, sustainable debt framework and is often misunderstood. Independent verification provides additional value to investors only to the extent that it reduces information asymmetry. To achieve this, the issuer must make two distinct decisions. First, the issuer must select an independent verifier whose scope of verification corresponds to the risk profile of the claim being made. For example, a simple framework making only limited claims about a project may be appropriate for a light, high-level "alignment opinion." However, when the issuer's narrative suggests strong integrity – i.e., taxonomy alignment, quantifiable impacts, or "best-in-class" processes – the verification must include substantial procedural depth to avoid creating an expectations gap that can create reputational and/or legal risks at a future date. Second, the issuer must establish and enforce safeguards to protect the verifier's independence and clarify the scope of the verification. Specifically, if the external review does not address the integrity of allocation or does

not verify critical methodological assumptions, the issuer must clearly disclose the limitations of the review. The white space logic is that a narrow-scope review can be considered credible if the issuer clearly discloses its limitations and does not misrepresent the review in promotional materials (ICMA, 2024)⁴⁰¹.

European regulatory developments reinforce this logic. When an issuer chooses to designate an instrument as a European Green Bond ("EuGB"), the requirements shift from market conventions to a regulated environment with specified pre- and post-issuance reviews and reporting templates aligned with the taxonomy. Regardless of whether an issuer elects to label an instrument as a EuGB, the existence of a EuGB designation creates a benchmark that investors can use as a reference point to evaluate the "integrity" of an issuer's claims. Therefore, issuers should construct their frameworks as modular systems: a process layer consistent with ICMA guidelines to facilitate international market acceptance, and an EU taxonomy mapping layer that can be activated when higher-integrity claims or EuGB designations are used. This modularity is important because many banks issue in multiple jurisdictions and to various investor bases; a single, monolithic framework can become brittle when differing requirements exist across labels or markets (European Commission, 2022)⁴⁰².

Finally, issuers must incorporate feedback mechanisms into their frameworks. Reviews conducted by external reviewers and audits conducted internally should not be viewed as transactional gateways; rather, they should be viewed as opportunities to improve controls. As such, issuers should document reviewer comments, assign remediation owners for identified issues, and update eligibility logic and/or data controls as necessary. Over time, this will create a quality flywheel: the bank's sustainable issuance becomes more defensible as controls improve, data improves, and reporting becomes more consistent. This, in turn, makes the bond label more attractive to constrained investors. In summary, a framework is credible when it is designed to produce evidence, verified to the degree required by the claim, and treated as a living control system rather than as a static marketing artifact (International Capital Market Association (ICMA), 2021)⁴⁰³.

Aligning Bond Issuance with Balance-Sheet Evidence

The easiest way for an issuer, such as a bank, to move from "white space" to "grey zone" is to create a contradiction between its climate disclosure at the individual bond level and its broader climate disclosure as an issuer. While investors will accept a degree of disclosure complexity, they typically

⁴⁰¹ International Capital Market Association (ICMA) (2024) Sustainability-Linked Bond Principles. Zurich: ICMA.

⁴⁰² European Commission (2022) Commission Implementing Regulation (EU) 2022/2453 ... as regards the disclosure of environmental, social and governance risks (amending Implementing Regulation (EU) 2021/637). Official Journal of the European Union.

⁴⁰³ International Capital Market Association (ICMA) (2021) Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds (June 2021 edition). Zurich: ICMA.

do not accept contradictions in governance. Hence, why Pillar 3 ESG disclosures are now functioning as a back-end audit of front-end marketing. If a bank continuously markets labelled bonds as being aligned with taxonomy or supporting the transition of taxonomy-aligned activities, yet its Pillar 3 disclosures lack clarity, have poor data quality, have limited scope, or show no connection between taxonomies KPI's and the issuances' promotional language, the market will begin to view the labelled program as a 'story telling overlay' versus an institutional capability.

The primary challenge here is that the two reporting systems that generate the disclosures are completely different. Reporting systems for individual bonds track allocations of bond proceeds and generate customized reports on their impacts. Reporting systems for Pillar 3 are based on standardized templates developed for regulators, which require consistent definitions, repeated disclosure schedules, and linkages to the balance sheet exposures. Because the two systems are separate, there is potential for structural contradictions: different definitions of exposure, different data sources, different boundaries, and different owners of governance.

An issuer operating in white space addresses this by creating a formal "crosswalk" of labelled issuance categories and Pillar 3 climate KPIs at the start of the labelled issuance program.

Operationalizing the crosswalk involves establishing classification logic. If a bank wishes to claim that a bond finances taxonomy-aligned activities, the bank must first define how it assesses taxonomy alignment internally. The bank must also identify who has ownership of the interpretation of technical screening criteria, and how evidence of DNSH/minimum safeguards is captured. That assessment of alignment must then be linked to the reporting logic used in Pillar 3 templates to report taxonomy-related metrics and other climate indicators. The goal is not that every euro of bond proceeds is matched to a Pillar 3 numerator in a straightforward manner; rather, it is that the bank can explain the differences with precision. Differences may arise for many reasons, including the fact that Pillar 3 metrics may be calculated as of a reporting date (stock), while bond allocations are tracked over time (flow). Additionally, differences may exist because Pillar 3 perimeters/exclusions differ from bond eligibility categories. An issuer operating in white space identifies the potential for these differences and documents the reconciliation rules so investors and supervisors can understand the difference.

Data governance is the second operational requirement. Climate disclosures through Pillar 3 demand consistent data fields, stable calculation processes, and clear explanations of methodology and coverage. If labelled issuance is created through a separate spreadsheet-based process, the bank creates instability: a small change to the data can trigger a reporting revision; a methodology change can disrupt year-to-year comparability; and a control weakness can surface at the worst possible time,

during market disruption or a regulatory inquiry. Therefore, linking Pillar 3 with labelled bonds is a technological and governance project: link bond allocation systems to the risk data warehouse; use the same identifier for exposures; manage versioning of methodologies; and implement sign-off processes involving risk, finance, and internal audit, not just sustainability and treasurer (European Banking Authority (EBA), 2025)⁴⁰⁴.

The third operational requirement is narrative discipline. Are investors increasingly evaluating coherence: does the bank's sustainable funding narrative align with its disclosed climate risk management, sector exposures, and transition planning? A bank can issue a high-quality labelled green bond yet still be questioned about its overall transition governance weaknesses. The ease with which investors can compare a bank's transition governance strengths is facilitated by Pillar 3 templates and associated regulatory disclosures. An issuer operating in white space takes advantage of this: it views Pillar 3 as the base-case disclosure layer and ensures that sustainable issuance communications do not go beyond what the prudential data supports. This is a strategic decision: it may limit marketing freedom in the short term; however, it reduces reputational and legal costs in the long term (European Central Bank (ECB), 2020)⁴⁰⁵.

Finally, linking Pillar 3 with labelled issuance improves execution economics. When an issuer demonstrates that bond proceeds, taxonomy mapping, and prudential KPIs are part of the same evidentiary chain, it becomes easier to hold within constrained portfolios. This results in lower investor due diligence costs and a reduced likelihood that holdings are "hard to defend" under changing product rules. In this type of environment, the label is not the value; the coherence is the value. The issuer that prevails is the one whose sustainable debt program is not merely labelled but is operationally and institutionally embedded within the bank's prudential reporting realities (European Commission, 2022)⁴⁰⁶.

Developing Impact Metrics That Withstand Scrutiny

Impact metrics represent one of the most common failures of sustainable debt claims, and it is not that the impact itself is irrelevant, but the complexity of measuring impact, the constraints of available

⁴⁰⁴ European Banking Authority (EBA) (2025) Guidelines on the management of ESG risks (EBA/GL/2025/01). Paris: EBA.

⁴⁰⁵ European Central Bank (ECB) (2020) Guide on climate-related and environmental risks: Supervisory expectations relating to risk management and disclosure. Frankfurt: ECB.

⁴⁰⁶ European Commission (2022) Commission Implementing Regulation (EU) 2022/2453 ... as regards the disclosure of environmental, social and governance risks (amending Implementing Regulation (EU) 2021/637). Official Journal of the European Union.

data, and the sensitivity of assumptions create an enormous "white space" between "numbers that impress" and "numbers ready for assurance." In practical terms, impact reports must be engineered to withstand scrutiny. To satisfy this requirement, the issuer must be able to show the source of input values; describe how calculations were made; detail the assumptions used; explain the limitations of each result; and provide a basis for comparing results over time. In other words, the impact metric that survives is not necessarily the one with the largest headline; it is the one with the greatest "evidence chain."

The first design principle is a hierarchical methodology approach. All impacts are not created equal in terms of their ability to withstand audit scrutiny. Certain metrics (such as financed renewable capacity and/or energy generation) can be directly tied to measurable data related to specific projects. Other metrics (such as "avoided emissions") rely significantly upon baseline/counterfactual assumptions. A white-space issuer does not prohibit the former, but it tightly governs the latter: it separates directly measured values from estimated values derived from models; it discloses its explicit assumptions regarding baselines; and it avoids combining incomparable methodologies into a single "total." The goal is to improve investor decision-making usability; investors need to know what they can compare based on directly measured values and what is directional based on modeled estimates. The second principle is standardization. Regulatory and assurance entities increasingly require banks to use accepted accounting standards to measure emissions and climate-related issues. Standardized approaches to measuring financed emissions have become key elements of credibility because they limit discretion and enable comparative analysis across different institutions. Recognized protocols provide the definitional foundation for assurance in measuring corporate and value-chain emissions (Financials, 2022)⁴⁰⁷. Impact metrics that align with recognized standards are not merely "best practices"; they entail lower legal risk because they indicate that the issuer employed reasonable, established criteria rather than creating ad hoc definitions that could be challenged as misleading (World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD), 2004)⁴⁰⁸.

Third, impact metrics must align with emerging disclosure requirements. Although the current landscape of bond-based impact reporting is largely narrative, the overall ecosystem is rapidly

⁴⁰⁷ Partnership for Carbon Accounting Financials (PCAF) (2022) The Global GHG Accounting and Reporting Standard for the Financial Industry (2nd ed.)

⁴⁰⁸ World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) (2004) The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised ed.). Washington, DC: WRI/WBCSD.

moving toward structured reporting and assurance. This creates two separate implications for issuers. First, impact methodologies must be versioned. If an issuer's methodology changes, the issuer must provide a "bridge" that enables comparisons or provide explanations of breaks. Second, data must be collected in a manner that allows them to be reconstructed. Issuers must be able to recalculate prior results using previously stored input values, rather than simply republishing a PDF. As digital reporting becomes more prevalent, third-party entities will increasingly triangulate bond-based impact claims against enterprise-wide sustainability disclosures and regulatory templates (European Parliament and Council, 2022)⁴⁰⁹. Therefore, the issuer must avoid using impact metrics that imply enterprise-wide outcomes the issuer cannot support.

Fourth, "withstanding scrutiny" implies the ability to anticipate the regulatory enforcement perspective. Regulators do not need to establish intent; they examine whether the claim was supported by substance, consistent, and non-misleading. Investors and civil society can also challenge exaggerated claims. The issuer's defence, therefore, is procedural and evidentiary; it provides evidence of governance, controls, assurance scope, and data lineage. An issuer's white-space impact report would read similarly to a controlled reporting artifact: include scope, methods, data quality, limitations, and assurance boundaries.

Finally, issuers should treat impact reporting as a component of crisis management resiliency. Most of the worst sustainability controversies arise from a disconnect between what the issuer implied and what it can prove. When the impact reporting system is robust, e.g., traceable inputs, stable methodologies, transparent limitations, the issuer can react quickly and credibly to challenges since it can demonstrate its work. However, when the system is weak, the issuer will likely defend itself and timelines will likely slip and uncertainty will grow, the exact conditions that amplify market and reputational damage.

Therefore, in summary, impact metrics will withstand scrutiny when they are developed around recognized standards; subject to the same level of governance as financial reporting; supported by retained data and documented assumptions; and presented with transparent discipline regarding limitations (ICMA, 2023)⁴¹⁰. This is not simply a matter of compliance. Rather, it represents the conversion mechanism through which a labelled bond is transformed from a marketing object to a

⁴⁰⁹ European Parliament and Council (2022) Directive (EU) 2022/2464 as regards corporate sustainability reporting (CSRD). Official Journal of the European Union.

⁴¹⁰ International Capital Market Association (ICMA) (2023) Harmonised Framework for Impact Reporting (June 2023). Zurich: ICMA.

decision-useful information object in European sustainable debt markets (International Sustainability Standards Board (ISSB), 2023)⁴¹¹.

⁴¹¹ International Sustainability Standards Board (ISSB) (2023) IFRS S2 Climate-related Disclosures (June 2023).

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