# Good Loan, Bad Loan

## Sustainability-linked loans and the quality of KPIs

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#### Abstract

Sustainability-linked loans (SLLs) have quickly grown to be the second-largest type of sustainable debt after green bonds. In theory, SLLs should incentivize borrowers to progress on sustainability objectives by linking the loan's interest margin to specific sustainability key performance indicators (KPIs). While the possibility of an inadequate selection of KPIs has repeatedly led to greenwashing concerns around SLL financing, little empirical work has been done to evaluate the quality of SLL KPIs in practice. Moreover, it is unclear if market participants differentiate between SLLs of high and low KPI quality. This study analyzes the KPI quality for a sample of listed borrowers using a scoring methodology based on the Sustainability-linked Loan Principles (SLLP) and subsequently investigates the stock market reaction to SLL announcements in an event study. The findings suggest considerable differences in KPI quality across borrowers and a weak incentivization of sustainability improvements on average. Furthermore, the event study results imply that investors only react positively to SLL announcements of high KPI quality, i.e., to the loans that convey a credible commitment to sustainability improvements. In contrast, no evidence suggesting a significant reaction to SLLs of low KPI quality is found. Lastly, this thesis finds that stock market participants are sensible to already small deviations in KPI design from the recommendations of the SLLP.

Keywords: Sustainable Finance, Sustainability-linked loans, KPIs

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## **1** Introduction

Sustainable debt financing has grown rapidly since the first corporate green bond issuance in 2013, experiencing strong interest from borrowers, investors, and lenders alike (Climate Bonds Initiative, 2013). Bloomberg estimates a record total issuance of USD 1,643bn across all sustainable debt types in 2021, more than double the 2020 figure of USD 762bn. While green, social, and sustainability bonds all saw strong growth in recent years, the emergence of so-called sustainability-linked financing has been a main driver of rapid market growth, with sustainability-linked bonds (SLBs) growing by 861% and sustainability-linked loans (SLLs) growing by 244% during 2021 (Bloomberg & Standard Chartered, 2022). While the sustainability-linked bond market is still much smaller compared to green bonds in terms of issuance volumes, sustainability-linked loans have long surpassed green loans on the bank financing side. Despite the growth, SLLs have received much less attention in academic literature compared to the publicly traded products in the bond markets (Kim et al., 2021).

Merely five years after the first corporate SLL was issued to Dutch multinational Philips in April 2017 (ING, 2017), SLLs have become the second-largest type of sustainable debt trailing only green bonds (Bloomberg & Standard Chartered, 2022). A central argument behind the popularity of SLLs is that loan proceeds are not reserved for specific green purposes but are general-purpose eligible. Therefore, SLLs are a viable financing option for a wider range of industries than green loans, whose borrowers are usually concentrated in the Utilities and Energy sectors (Kim et al., 2021). Because of the widespread borrower universe including borrowers in "brown" industries, SLLs have been subject to greenwashing concerns, with first studies indicating that SLLs are indeed used by some borrowers to showcase empty commitments to sustainability objectives (Carrizosa & Ghosh, 2022).

I start this thesis by providing background information on sustainability-linked loans and the mechanism that differentiates SLLs from conventional loans. In short, SLLs link the interest margin of the loan to a firm's sustainability performance measured by pre-defined key performance indicators (KPIs). It is widely agreed that the adequate selection of KPIs is central to the credibility of SLLs and their effectiveness in incentivizing sustainability improvements of the borrower. To provide best-practice SLL design, the Loan Market Association (LMA) has published the Sustainability Linked Loan Principles (SLLP) and separate guidelines for lenders and borrowers to rely on (LMA, 2021).

However, to date, little is known about the true KPI quality of SLLs in the market. Furthermore, it is unclear whether market participants distinguish between high- and low-quality SLLs. This thesis fills a gap in existing research by investigating whether financial markets can observe the quality of SLLs and subsequently value high-quality SLLs differently than low-quality SLLs. Moreover, the question of whether low-quality SLLs consistent with greenwashing concerns trigger a negative stock market reaction is addressed.

After describing SLL mechanics, I delineate the sustainability-linked loan market from the market for green loans. Using SLL data on the issuer level obtained from Refinitiv/Eikon, I provide descriptive statistics on the European market level. The findings suggest that SLL financing is used by borrowers from a wide range of industries, with the highest issuance volumes in capital-intensive sectors like Industrials, Utilities, or Basic Materials. However, SLL financing is also used by borrowers in the Healthcare and Technology sectors. Green loans in contrast are more concentrated on the Utility and Renewable Energy sectors and typically related to project financing. For SLLs, the general-purpose eligibility of proceeds translates into a higher share of revolving credit facilities and fewer term loans, especially among listed borrowers.

For a sample of listed firms in the UK, Germany, and the Nordics, I then analyze SLL KPIs. As KPI data is not available through the usual databases, all information is compiled manually by screening press releases, annual and sustainability reporting, and news outlets. For a sample of 226 SLLs, 23 loans do not come with any KPI information. For the remaining 203 SLLs, a total of 405 KPIs are collected. Thus, many SLLs relate to several KPIs and comprise a combination of environmental and social objectives, or ESG ratings. Overall, environmental KPIs, such as greenhouse gas (GHG) reduction, energy efficiency, or recycling targets are the most used.

To evaluate the KPI quality of SLLs in the sample, I apply a scoring framework developed by Auzepy et al. (2022) based on the Sustainability-linked Loan Principles. The framework is used to analyze SLLs along six dimensions and assigns a total score to each SLL by adding all dimensional scores.

Similar to previous studies, I find that SLLs vary significantly in KPI quality. While most borrowers align KPIs with their sustainability strategies and use quantifiable metrics, KPIs are often not material from an industry perspective and lack transparency regarding pricing incentives and external reviews. My average scoring result indicates that most SLLs are not effectively designed to incentivize sustainability improvements of the borrower.

In the second part of this thesis, the stock market reaction to SLL announcements of different KPI qualities is analyzed to see whether investors differentiate between "good" and "bad" SLLs. Conducting a short-run event study to investigate cumulative abnormal returns (CARs) around the SLL announcement date, I find that the stock market generally reacts positively to SLL announcements. Consistent with previous studies on sustainability-linked bonds, I obtain evidence supporting a signaling effect of sustainable debt (Mattsson & Starrsjö, 2022), as the reaction is stronger for first-time borrowers, while only being insignificant for subsequent borrowers in the sample.

Using a percentage ranking function on the KPI score of each SLL, I construct four subportfolios based on KPI quality. The portfolio of the highest quality exhibits the highest abnormal returns in the event study, while lower-quality SLLs do not show significant abnormal returns. Consequently, I conclude that investors only react positively to SLL announcements that convey a credible commitment to sustainability improvements. On the other hand, I do not find evidence that the announcement of low-quality or untransparent SLLs is followed by a negative market reaction. Therefore, it remains unclear whether the market punishes lowquality SLLs consistent with greenwashing concerns. Finally, as I find a statistically significant difference in the market reaction of the highest-quality portfolio and the second highest-quality portfolio, it seems that investors already react to small compromises in SLL quality.

## 2 Background on sustainability-linked loans

The first corporate SLL was issued in April 2017 to Dutch multinational Philips as a EUR 1bn revolving facility, with ING acting as sustainability coordinator in the deal. The interest rate of the loan was tied to the Sustainalytics ESG rating of Philips (ING, 2017). Starting in Western Europe, a rising number of SLLs soon after emerged across Europe and subsequently started to spread overseas. SLLs gained high popularity in North America in 2020, and in 2021, the U.S. became the largest issuer of SLLs globally. Measured by cumulative issuance volumes, Europe to date is still the largest market (Pohl, 2022). In this context, Kim et al. (2021) argue that SLL lending is most prevalent in countries with higher sustainability expectations by stakeholders.

Initially most common among large corporates as revolving facilities, SLL financing has gained popularity in the form of many other loan types, including term loans and Capex facilities. Consequently, the share of ESG-contingent financing among investment-grade loans in EMEA has increased from 12% in 2018 to 36% in 2022, with experts claiming a 50% share by the end of 2023 to be in reach (Bloomberg, 2022). While SLLs are becoming mainstream among investment-grade loans, they have also reached the field of leveraged loans and buyout financing with a slight time lag (Girard et al., 2022).

#### 2.1 The SLL mechanism

What exactly are sustainability-linked loans? According to the Sustainability-linked Loan Principles (SLLP), SLLs comprise "any type of loan instruments and/or contingent facilities [...] which incentivize the borrower's achievement of ambitious, predetermined sustainability performance objectives" (APLMA, 2021). To track progress on sustainability objectives throughout the life of the loan, a borrower's sustainability performance is measured against quantifiable key performance indicators (KPIs). The KPIs can relate to either environmental, social, or governance objectives or a combination thereof, as found in sustainability ratings. For each KPI, borrowers agree with lenders on sustainability performance targets (SPTs) that the borrower should reach within a predefined period. The borrower's actual performance relative to the SPTs will be reflected in the loan terms, typically through a margin step-up or step-down affecting the loan's interest rate.

To facilitate the growth of the SLL market while at the same time safeguarding the integrity of the product, the Loan Market Association (LMA) in cooperation with the Loan Syndication and

Trading Association (LSTA) and the Asia Pacific Loan Market Association (APLMA) developed the SLLP. The SLLP are designed to assist lenders and borrowers in the issuance process, providing clarification regarding (1) the selection of KPIs, (2) the calibration of SPTs, (3) loan characteristics, (4) reporting, and (5) verification. In the following, the SLL mechanism as proposed by the SLLP is further explained:

- (1) The SLLP specifically emphasize the importance of carefully selected, credible KPIs for the success of SLLs as a financing instrument. According to the SLLP, KPIs need to be both material to the borrower's sustainability strategy and relevant to the borrower's industry. Moreover, KPIs should be quantifiable and benchmarkable to external references to enhance credibility. Lastly, SLL documentation should also include clarifications regarding the definition, scope, and calculation methodology for each KPI.
- (2) Setting ambitious SPTs for each KPI is important, as the SPTs ambition level reflects the borrower's commitment to sustainability improvements. SPTs should represent a material improvement compared to the borrower's status quo, rather than a "Business as Usual trajectory" (APLMA, 2021). In addition, SPTs should be based on a combination of benchmarking approaches, including the borrower's historical performance, industry peers, national and international targets, and science-based references. To increase the credibility of KPIs and SPTs, the SLLP recommend that borrowers get a Second-Party Opinion (SPO) pre-signing of the loan facility to double-check the appropriateness of the selected KPIs and SPTs.
- (3) To incentivize sustainability improvements and qualify the loan as SLL, an economic outcome must be linked to the achievement of SPTs. Typically, the loan's margin is adjusted upwards or downwards by a predefined amount (bps) conditional upon meeting SPTs for one or more KPIs.
- (4) Once the loan has been signed, borrowers are encouraged to be transparent about their KPI development and provide the lenders at least once a year with the necessary information to accurately monitor SPT achievement. The SLLP also recommend making information on SPTs publicly available, as increased transparency facilitates trust in SLLs as a sustainable debt financing alternative.
- (5) The SLLP require independent and external verification of SPTs for each KPI before lenders evaluate the borrower's performance. Independent review can be done by qualified auditors, environmental consultants, or independent rating agencies.

### 2.2 Comparison of sustainability-linked and green loans

Green loans (GLs) and SLLs follow two different approaches to sustainable finance. According to the Green Loan Principles (GLPs), green loans "are any type of loan instruments and/or contingent facilities [...] made available exclusively to finance, re-finance or guarantee, [...] new and/or existing eligible Green Projects and which are aligned to the four core components of the GLP" (LMA, 2023a). Hence, GL proceeds are earmarked for predefined green projects, meaning that the borrower commits to invest all loan proceeds in a way that creates a green benefit. Therefore, GLs, like social loans, green/social/sustainability bonds follow a "use of proceeds" approach.

This approach has repeatedly been criticized for excluding firms that do not have significant Capex requirements or firms whose economic activity makes it difficult to identify eligible projects. As such, research finds that green bond issuers have higher environmental scores in ESG ratings than other bond-issuing public firms and that green bonds are more prevalent in industries with lower environmental risk (Flammer, 2021). Moreover, despite committing to a green project, a borrower's overall sustainability performance could still deteriorate through projects that are not part of the green bond/loan framework, leading to greenwashing concerns (Caldecott, 2020).

To some extent, performance-based financing is designed to overcome the aforementioned concerns. SLLs do not restrict borrowers in their allocation of proceeds but are general-purpose instruments. Instead of committing to a specific project, SLL borrowers commit to a future outcome, namely the improvement of their sustainability profile using SPTs bound to relevant KPIs (APLMA, 2023b). As a result, SLLs should be accessible to a wider range of borrowers, including those whose sustainability performance to date is below average and those whose industry restricts the availability of green projects to date. At this point, it should be noted, that greenwashing concerns against sustainability-linked financing have been raised by practitioners and academics, which are addressed in the literature review. So far, these concerns have not hampered the growth of SLLs.

#### **3** Literature review

First, I review the academic literature on sustainability-linked loans to investigate the growth drivers of this loan product in section 3.1. Second, in section 3.2 of this literature review, I further seek to understand how investors perceive SLL issuance in the stock market and whether borrower-specific SLL characteristics like KPIs influence this perception.

Given the novelty of the field, existing research, especially empirical work, is rather limited. While a growing number of SLL-specific papers were published in 2021 and 2022, the scope of the literature review is extended to the broader field of sustainable debt financing, including green and sustainability-linked bonds.

#### 3.1 Literature on SLL issuance motives

The question of why firms use sustainability-linked loans is of particular interest as it could even be counterintuitive for borrowers to choose SLLs over conventional loans, due to the likely administrative and financial burden imposed by identifying, monitoring, and improving relevant sustainability metrics (Kim et al., 2021). In addition, some borrowers face financial penalties in the form of margin step-ups in case SPTs cannot be reached. As many firms nevertheless chose to issue SLLs over conventional loans in recent years, 5 central issuance motives can be identified in relevant literature: (1) A signaling effect of sustainable debt, (2) benefits for the borrower's sustainability strategy, (3) general-purpose eligibility of proceeds, (4) lower cost of debt, and (5) social preferences. In the following, each motive is reviewed before greenwashing concerns are addressed as those have been repeatedly raised in the literature as well.

An important motive behind the issuance of SLLs seems to be a signaling effect of sustainable debt. Signaling refers to an action that conveys information credibly and thus reduces information asymmetry between two parties (Akerlof, 1970; Spence, 1973). In the context of green bonds, Flammer (2021) points to the signaling effect as a main driver of issuance growth. She argues that while investors generally have a strong desire for transparency on ESG issues, publicly available information is often insufficient to evaluate a borrower's commitment to sustainability objectives. Therefore, truly committed companies need to find a way to reduce the prevalent information asymmetry by conveying information credibly (Ilhan et al., 2019). The issuance of sustainable debt sends a credible signal to investors, as firms commit to either a specific green project in the case of use of proceeds financing or to specific sustainability objectives in the case of performance-based financing.

In the case of performance-based financing, a double incentive mechanism of borrowers adds credibility to the signal. If the debt characteristics are aligned with the recommendations of the SLLP, a borrower is financially incentivized to achieve sustainability objectives through penalties on the interest margin. In addition, as the SLLP encourage borrowers to publicly report KPIs and SPTs of the debt instruments, firms might also be held publicly accountable for their targets (Kim et al., 2021).

Furthermore, cooperation with external parties and lenders in the SLL issuance process can be beneficial for the overall sustainability strategy of borrowers (Loumioti & Serafeim, 2022). While a firm's internal resources might not always be sufficient to advance on ESG objectives, borrowers can make use of a bank's sustainability experience to sharpen their own ESG strategy and benefit from continuous monitoring by lenders throughout the life of the loan. As the cost of issuing SLLs is typically lower compared to the issuance of sustainability-linked bonds, SLLs also are a first step into sustainable finance for many firms (Dursun-de Neef et al., 2022). Moreover, the general-purpose eligibility of SLL proceeds makes SLLs a viable option for a broader set of borrowers across different industries (Kim et al., 2021).

Financial incentives come into play if borrowers successfully achieve their SPTs. Kim et al. (2021) investigate pricing differences in loan margins using a matching method of SLLs and conventional loans. The results suggest that SLLs are issued at similar margins compared to conventional loans but then have the possibility of margin adjustments which can reduce interest payments. This observation is in line with evidence in earlier research that the sustainability profile of borrowers and the awareness of climate-related risks influences the cost of debt (Herbohn et al., 2019; Jung et al., 2018).

Other research connects sustainable debt issuance with theory related to impact investing. Research regarding investment allocation to socially responsible mutual funds indicates that some investors are driven by an emotional evaluation of impact and only to a lesser extent by financial considerations (Heeb et al., 2022; Riedl & Smeets, 2017). Similar to mutual fund investors, the contracting of SLL facilities could be driven by the desire of borrowers and lenders to set up debt financing in accordance with their social preferences. In practice, some borrowers choose to donate savings from margin decreases to charity instead of keeping the funds in the company, supporting the impact argument (Auzepy et al., 2022).

SLLs and SLL contract design have also been subject to greenwashing concerns (Carrizosa & Ghosh, 2022). Notably, the American oilfield services company Schlumberger announced that it obtained EUR 750m SLL financing in June 2021, while KPIs had not been selected at the time. The KPIs would later be added at the borrower's own discretion and without lenders' need for approval (International Financial Review, 2021). While this case is regarded as a more extreme one, SLL KPIs have generally been subject to increased scrutiny, and are regarded as deterministic for the credibility of SLLs (Agreda, 2023).

### 3.2 Literature on KPI quality and stock market reaction

As this thesis combines a qualitative assessment of SLL KPIs with an event study on the stock market reaction to SLL announcements, relevant papers could be identified in both areas of interest. However, to the best of my knowledge, I am first to link the two areas by investigating how KPI quality influences stock market reactions to SLL announcements.

Given the infancy of SLLs financing, the research focus in this area has mostly been on borrower characteristics and pricing. Qualitative research on loan documentation in contrast still seems rare. Most notable in the context of this thesis are Auzepy et al. (2022), who develop a framework to evaluate KPI quality, arguing that the selection of adequate KPIs is crucial for the effectiveness and credibility of SLLs. The framework is based on the recommendations of the SLLP and is used to evaluate individual SLLs along the six scoring dimensions strategic relevance, financial materiality, measurability, benchmarking ability, pricing mechanism, and external review. The scores from each of the six dimensions are aggregated so that every loan obtains a "total" KPI score. Applying this framework to a dataset of 291 SLLs issued in the European Union between 2017 and 2021, the study finds significant differences in the KPI quality of different SLL borrowers, which is expressed by a diversion of scores across the six dimensions. Auzepy et al. (2022) further state that SLL KPIs are on average not designed to effectively incentivize sustainability improvements of borrowers. As I later use the framework on my own dataset, the scoring methodology is explained in more detail under section 5.1.

In contrast to KPI quality, event studies on stock market reactions to the issuance of sustainable debt have been conducted several times with a focus on different sustainable debt products. While the literature widely agrees on the fact that no significant abnormal returns occur for conventional bond issuances, in the context of corporate green bonds, Flammer (2021) finds a significant average cumulative abnormal return (CAR) of 0.49% in a short-run event study

using a sample of 384 green bonds. Thus, it can be argued that the abnormal returns are likely a result of a borrower's commitment signal to sustainability objectives, rather than of the bond issuance itself (Flammer, 2021).

Following this argumentation, Mattsson & Starrsjö (2022) investigate the stock market reaction to sustainability-linked bonds and find a significant average CAR of 1.06%. Like Flammer (2021), they find a higher average CAR for first-time issuers compared to second or third-time issuers, which is arguably linked to stronger signaling effects of the first issuance.

In contrast to green and sustainability-linked bonds, it is still debatable whether a positive stock market reaction also persists in the context of SLLs. So far, fewer event studies on SLL announcements have been conducted, which likely is also connected to the fact that data availability on SLLs is more restricted due to the bilateral nature of loans<sup>1</sup> compared to publicly available bond data (Kim et al., 2021). Nevertheless, Kim et al. (2021) conduct a short-run event study on two sub-samples of 264 high-transparency and 148 low-transparency SLLs. The findings suggest that only high-transparency SLLs exhibit a positive average CAR, while low-transparency SLLs only have a low or negative and insignificant average CAR. This result is highly interesting for this thesis as the measurement of KPI quality is also dependent on a high degree of transparency around SLL announcements.

<sup>&</sup>lt;sup>1</sup> As nearly all SLLs in my sample are syndicated, bilateral in this case refers to the borrower on one side and the lending syndicate on the other side.

## 4 Data

This study compiles a unique dataset of sustainability-linked loans (SLLs) and green loans (GLs) issued in Europe between January 1, 2016, and December 31, 2022. The main data source is Refinitiv/Eikon, where the fixed-income screening tool enables to search for different types of sustainable debt products through a "market segment" filter. While this work focuses on SLLs, data on GLs has also been extracted to differentiate the respective markets by highlighting key similarities and differences in loan type, use of proceeds, country, and borrower industry. Stock market data for the event study is obtained from S&P Capital IQ.

In Eikon, loan data on the tranche level is obtained by selecting the "sustainability-linked loan" and "green loan" market segments, using a geographic restriction on Europe. The obtained output comprises 2905 entries, of which 1955 are classified as SLLs and 950 are classified as GLs. However, tranche-level data means that in many instances a single borrower has several entries on a single issuance date, typically also issued by the same lending syndicate. For this study and to avoid overstating the true number of loans, tranche/product-level data is aggregated to a facility level. In the context of this study, a loan facility comprises all products (e.g., term loan, revolving facility) and tranches of different maturities and/or currencies issued on the same date to a single borrower. Consequently, 1215 SLL facilities with a total volume of EUR 753bn, and 484 GL facilities with a total volume of EUR 159bn are obtained.

Bankia's acquisition finance loan of EUR 175m to Siemens Gamesa in February 2020 was initially classified as both SLL and GL in the data. While loans can generally fulfill both green and sustainability-linked criteria at the same time, in this case, manually verifying SLL mechanics was not possible, and the loan was reclassified to GL only (Siemens Gamesa, 2020). Verifying the completeness of the dataset is generally difficult and is further complicated by the geographic focus on Europe (rather than a global or EMEA focus used by Bloomberg). On a negative note, the first corporate sustainability-linked loan issued to Philips in April 2017 is missing in the data (ING, 2017), although this could be due to the novelty of SLLs in 2017 and thereof resulting problems in categorization. I find that the Eikon data is reasonably close to other market size estimates, e.g., in a comparison with global issuance volumes reported by Bloomberg (Bloomberg, 2022).

<sup>&</sup>lt;sup>2</sup> Bloomberg New Energy Finance - at the time of writing market size data is only available until 2021

#### 4.1 Descriptive statistics on the European SLL and GL markets

According to the Eikon data, the European SLL market stands at a cumulative issuance volume of EUR 753bn at year-end 2022, almost 5 times the EUR 159bn volume of the GL market. While Green Loans doubtlessly experienced strong growth since their introduction to corporate financing in 2014 (Climate Bonds Initiative, 2014), the growth of SLLs has been even stronger. Figure 1 shows that the SLL market experienced particularly high growth rates in 2021 with both number and issuance volumes being significantly higher than in all previous years together. While the number of SLL issuances further increased in 2022, total issuance volume stands slightly lower year-over-year at EUR 282bn vs. EUR 291bn in 2021.

In terms of loan size, SLL facilities are found to be almost twice as large as GL facilities. The average (median) SLL issuance volume is EUR 620m (EUR 275m) compared to EUR 328m (EUR 136m) for GLs.



Figure 1: Cumulative SLL and GL issuance volumes in Europe

A geographic market breakdown displayed in Table A1 reveals that France is the European country with the highest SLL issuance volume (EUR 146bn), followed by Germany (EUR 99bn), the UK (EUR 98bn), and Spain (EUR 83bn). Measured by the number of loans issued since 2016, Spain (209) and France (208) are the most active jurisdictions, followed by the UK (163), Germany (146), Italy (105), and the Netherlands (73).

Furthermore, the Nordic region comprising Finland, Sweden, Norway, and Denmark proves to be a significant part of the European market with a combined 143 loans at a volume of EUR 89bn.

#### [Table A1]

Overall, the SLL market is less geographically concentrated than the GL market. Table A2 shows that a significant share of 29% of GLs (141 loans) is issued to firms incorporated in Spain. The UK comes second with only half the number of GLs issued but is a larger market measured by issuance volumes at EUR 44bn (26% of total issuance volume) compared to EUR 30bn in Spain. A likely reason for the higher geographic concentration of GLs compared to SLLs in Europe is the project finance nature of GLs. The data reveals a significant share of GLs in Spain and the UK related to the utility/renewable energy space, with a concentration of photovoltaic power (PV) financing in Spain and wind power financing in the UK.

#### [Table A2]

An overview of green loan issuance by industry in Table A3 confirms a concentration on renewable energy projects. Using The Refinitiv Business Classifications (TRBC) for industry definitions, I find that 158 out of 484 GLs in the dataset (38%) are issued to firms in the utility sector. An additional 29 GLs (6%) relate to firms in the energy sector, although less than Real Estate (74), Industrials (70), and Financials (61). Other industries are rather insignificant in size.

While 50% of green loan issuance volume is used for eligible projects in the utility and energy sector, Table A4 shows that the SLL market is more evenly distributed across industries. Most loans relate to Industrials (247), followed by Consumer Cyclicals (171), Consumer Non-Cyclicals (130), Basic Materials (129), Financials (125), and Utilities (122). While the utility sector has the sixth-highest number of SLLs across TRBC industries, an issuance volume of EUR 109bn makes it the second-largest sector after Industrials (EUR 150bn).

Real Estate, Technology, and Energy also exhibit significant issuance volumes above EUR 30bn. These findings are coherent with Kim et al. (2021) and confirm that the general-purpose character of SLLs allows a wider range of borrower industries to access sustainable debt.

[Table A3]

[Table A4]

Indeed, three-quarters of all SLLs in the data are issued for general corporate purposes (75.7%). Table A5 reports the number and issuance volumes by use of proceeds. Although less common, SLL proceeds are also used for a variety of specific purposes, including refinancing (5.2%), Leveraged Buyouts (4.4%), acquisition finance (3.6%), project finance (2.9%), mortgages/real estate financing (2.5%), working capital (2.3%), Capex facilities (1.9%), and aircraft & ship finance (1%).

In contrast, GLs are predominantly issued for project financing (47.3% of GLs), with more than 56% of GL proceeds falling into this category (Table A6). Other uses of proceeds include general corporate purposes (27.6%), real estate financing (9.5%), Capex facilities (7.4%), and acquisition finance (3.9%).

## [Table A5]

#### [Table A6]

As bank financing comprises several different loan products, GL and SLL borrowers, like borrowers of conventional loans, can choose the loan type that best suits their financing needs. Often the use of proceeds has direct implications on what loan type is the most suitable financing option. The most common SLL product in the dataset is revolving facilities. Despite making up only 40.6% of all SLLs issued, the loan volumes of revolving facilities equal 66.7% of the total SLL issuance volume. Term Loans are the second most common product (34.7% of SLLs), followed by Schuldschein (12.5%) and Capex facilities (2%). For 160 SLL products (8.2%), it was not possible to classify the loan product (Table A7).

The situation in the GL market is found to be exactly inverted (Table A8), as Term Loans are the most common product at 43% of all GLs issued, corresponding to 51.8% of total GL issuance volumes. 18.4% of GLs are issued in the form of revolving facilities and 8.4% as Schuldschein.

[Table A7] [Table A8]

#### 4.2 Descriptive statistics on the sample of publicly listed firms

After gaining an understanding of the European SLL market, its loan products, and the use of proceeds in comparison to the GL market, the focus of this thesis shifts solely to SLLs. More specifically, I aim to examine the loan characteristic that is crucial to the credibility and effectiveness of SLLs as a form of sustainable debt financing: SLL KPIs.

KPI data is usually not available through databases, making gathering data a highly manual process. Hence, data can only be hand-collected through screening of press releases, annual and sustainability reports, or websites for financial and sustainability news. As data availability is highly dependent on borrower transparency and reporting, the sample size further needs to be reduced by concentrating on SLLs issued by listed firms in the UK, Germany, and the Nordics (Denmark, Finland, Norway, and Sweden).

Applying the above criteria yields a sample of 248 SLL facilities issued by 205 unique borrowers and a total issuance volume of EUR 185.2bn. Thus, the sample represents c. 20% of SLLs or 24% of SLL volume issued in Europe between 2017 and 2022. Figure 2 displays yearly issuance volumes and the number of SLLs issued between 2017 and 2022 for the listed firm sample.



Figure 2: Listed firm sample - yearly issuance volume and number of SLLs

Table A9 reports SLLs by borrower country. Out of the 248 facilities, 85 SLLs were issued to UK borrowers, followed by Germany (70), Finland (37), Sweden (25), Norway (19), and Denmark (12).

#### [Table A9]

I report the same descriptive statistics as on the European market level before and find a similar SLL distribution across industries as compared to the European SLL market (Table A10). Industrials (45 loans) and Consumer Cyclicals (41) are the largest sectors with the highest number of issuances, followed by Basic Materials (38). Healthcare is the smallest sector (7 loans), with an issuance volume of just over EUR 5bn. Table A11 shows that 88% of SLLs in the listed firm sample are general-purpose loans, thus even higher than in the complete dataset (75.2%). Given the focus on listed firms, use-of-proceeds in this sample does not entail Leveraged Buyouts, which could potentially explain the higher share of general-purpose financing. The same argument applies when it comes to a higher concentration of revolving facilities (56.9%) in the listed firm sample and a lower share of term loans (13.2%). I also find a higher share of Schuldschein financing due to the popularity of this instrument in Germany, while German borrowers represent a significant part of the sample. SLLs by loan type for the listed firm sample are reported in Table A12.

[Table A10] [Table A11] [Table A12]

## 5 SLL KPIs

## 5.1 Scoring methodology

To evaluate the quality of KPIs, I apply a framework developed by Auzepy et al. (2022) which is based on the Sustainability-linked Loan Principles (SLLP) and the guidance on the SLLP issued by the LMA (LMA, 2023b). The framework assesses SLL KPIs along six dimensions. For each dimension, a score of 0, 0.5, or 1 will be assigned to each SLL, with 0 corresponding to non-compliance, 0.5 to partial compliance and 1 to full compliance. The scores for each dimension are added together to yield a total score between 0 (weak) and 6 (strong). To make the KPI collection and the scoring process more transparent and illustrative, Appendix C contains examples of SLL KPIs that received a perfect score of 1 in a specific dimension. In this section, the six scoring dimensions are explained in more detail in general terms.

The first dimension is based on the recommendation of the SLLP that KPIs should be relevant to the borrower's sustainability strategy (Loan Market Association, 2021). In order to receive the full score of 1, "a KPI must either be an integral part of a clearly defined sustainability strategy or complement key sustainability objectives set by the company at latest in the year in which the SLL was issued" (Auzepy et al., 2022). A score of 0 will be assigned if the KPIs are not aligned with the borrower's sustainability goals or if the information is not publicly available. The SLL receives a score of 0.5 whenever the KPIs are only partially relevant to the borrower's strategy (e.g., only 1 out of 2 KPIs is relevant).

Second, apart from alignment with a borrower's sustainability strategy, KPIs also need to address relevant ESG challenges of the sector (Loan Market Association, 2021). This view is supported by research, including Khan et al. (2016), who argue that only sustainability objectives that are relevant to the sector will be financially material to a company in the long term. Using the materiality finder developed by the Sustainability Accounting Standards Board (SASB), material issues for each sector can be identified (SASB Standards, 2023). An SLL scores 1 point in this dimension if all KPIs are related to one or more material issues, while a score of 0 is obtained if no KPI relates to a material issue. In case the SLL contains both material and immaterial issues from an industry perspective, a score of 0.5 is assigned.

The third dimension assesses whether KPIs are quantifiable, i.e., expressed in clear numerical values to provide an effective incentive to the borrower. While SLLs without quantifiable KPIs are given a score of 0 and SLLs with quantifiable KPIs only are given a score of 1, SLLs with both quantifiable and non-quantifiable KPIs will score 0.5.

Fourth, the SLLP recommend that KPIs should be benchmarked to external definitions, regulatory standards, or taxonomies (Loan Market Association, 2021). This should enable a better assessment of the borrower's level of ambition, as KPIs and their respective SPTs can for instance be evaluated against industry peers and sector standards. The SLLP guidance further recommends aligning KPIs with frameworks like the Greenhouse Gas Protocol and regulatory targets set out in the Paris Agreement or on a regional/national level (Loan Market Association, 2023b). A score of 1 is assigned if all KPIs are quantifiable and can be benchmarked, while a score of 0.5 is assigned if there are both benchmarkable and non-benchmarkable KPIs in the loan documentation. Naturally, if no KPI can be benchmarked the loan will score 0 points in the fourth dimension.

Following the methodology of Auzepy et al. (2022) ESG rating KPIs are treated as a special case because it is not possible to fully verify the compliance of ESG ratings with the first two dimensions. Moreover, given the advanced calculations of rating scores and differences in methodology and rating scales between different rating providers, for an outsider, it is not possible to quantify and compare rating scores. Therefore, unless the SLL contains an additional individual KPI, a score of 0 will be assigned to the first three dimensions. On the other hand, ratings can be used to benchmark sustainability performance against peers that are rated by the same provider. Hence, a score of 1 will be assigned to rating KPIs in the fourth dimension.

While a core characteristic of SLLs is a reduction in the interest margin conditional upon the achievement of SPTs, the fifth dimension examines whether the loan comes with a penalty in the form of a margin increase in case SPTs are not sufficiently achieved by the borrower. Auzepy et al. (2022) refer to this as a "malus system", arguing that the implementation of a malus system translates to a higher level of commitment to sustainability targets by the borrower. While no information on margin adjustments leads to a score of 0, an explicit mention of a margin reduction receives a score of 0.5 points. A score of 1 is achieved only if the loan contains margin adjustments in both directions. Similar to Auzepy et al. (2022), the actual basis point margin increase/decrease is not considered in the scoring process, as this information is not publicly available for most SLL issuances.

Finally, the last dimension verifies whether KPIs are subject to external review and verification, as suggested by the SLLP: "Borrowers must obtain independent and external verification of the borrower's performance level against each SPT for each KPI (for example, limited or reasonable assurance or audit by a qualified external reviewer with relevant expertise, such as an auditor, environmental consultant and/or independent ratings agency)" (Loan Market Association, 2021). No mention of external verification leads to a score of 0, while explicit mention leads to a score of 1. If only one KPI is subject to external review or evidence that the review is performed as a one-time progress certification only is obtained, a score of 0.5 is assigned.

## 5.2 KPI scoring results

While manually compiling KPI information on the individual SLL level from press releases, annual and sustainability reports, or news outlets, I find significant differences regarding the ease of information collection and the borrower's transparency on KPIs across the sample. In 17 out of 248 cases, it was not possible to find any information on the loan or to verify the loan being sustainability-linked rather than conventional. Moreover, 5 loans in the sample were issued under a use-of-proceeds framework as green loans rather than SLLs, reducing the sample size to 226 SLLs.

For this sample of 226 SLLs, a total of 405 KPIs are reported. As no KPI information was published for 23 SLLs, the true average number of KPIs per loan is close to 2 (405 KPIs divided by 203 SLLs). Table B1 displays the number of KPIs per loan ranging from 1 to 4 and shows that SLLs structured around 1, 2, or 3 KPIs occur almost equally often (in the case of 71, 60, and 64 SLLs, respectively), while 4 KPIs (8 SLLs) per loan are much less common.

#### [Table B1]

Each individual KPI is assigned to a category belonging to one of four pillars: Environmental, Social, Governance as well as ESG to reflect ratings or a combination of the first three pillars. To provide a basis for comparison with previous and future work, I use the classification scheme of Auzepy et al. (2022) which is based on the SLLP. As shown by Table B2, the majority of KPIs relate to Environmental objectives (63.7%), while Social and Governance themes are found in less than 25% of KPIs. 12% of KPIs are in relation to ESG ratings. Greenhouse gas emissions are the single most used KPI (34.6%), followed by ESG ratings (10.9%), and social objectives including employee diversity and gender equality (6.9%), and employee health and safety (6.2%). Other frequently used KPIs relate to energy efficiency, circular economy, and sustainable products. These findings are similar to Auzepy et al. (2022), with the exception of a lower share of ESG rating KPIs in my data. This result is in line with my expectations, given that my sample is skewed towards SLLs issued in 2021 and 2022 when the share of ESG KPIs was gradually decreasing.

#### [Table B2]

Figure B1 reports the scoring results across the six dimensions laid out in the Auzepy et al. (2022) framework. Coherent with the results of the framework designer, I also find significant differences in scoring distribution across the six dimensions.

The first dimension assesses whether KPIs are core to the borrower's sustainability strategy as communicated through annual and sustainability reporting. In general, firms seem to comply well with this criterion as 134 out of 226 SLLs (59.3%) contain KPIs that are fully relevant. In many cases, borrowers highlight that their KPIs are derived from sustainability initiatives or the overall strategy through direct referencing in press releases or financing updates: *"The new credit facility is fully linked to Nilfisk's sustainability targets [...]. These targets will in turn support the delivery of Business Plan 2026 and the company's strategy towards long-term sustainable growth"* (Nilfisk A/S, 2022). This suggests that the signaling argument of SLLs is important to borrowers and that SLLs are designed to be a credible commitment to sustainability improvements (Auzepy et al., 2022). The 68 SLLs (30.1%) that score zero points consist of 23 cases where I did not find any KPI information and SLLs using only ESG rating scores as KPIs. 10.6% of SLLs contain partially relevant KPIs.

Regarding the second dimension, I find that 84 SLLs (37.2%) use KPIs that are not material from an industry perspective, while 66 loans (29.2%) use partially material KPIs. Only 76 loans (33.6%) in the sample have material KPIs from an industry perspective. Although most borrowers align SLL KPIs with corporate sustainability objectives, they often seem to choose targets of lower industry importance. Auzepy et al. (2022) find similar results and argue that choosing immaterial KPIs from an industry perspective can negatively affect the desired signaling effect of SLLs. As the SASB materiality map points out issues most likely affecting the financial performance of companies in that specific industry, these issues should also be the most relevant from an investor perspective (Grewal et al., 2016). Targeting different objectives through SLL KPIs thus could be of little signaling value to investors.

In the third dimension, firms generally perform well when it comes to selecting quantifiable KPIs. 128 SLLs (56.5%) use KPIs that can be expressed in clear numerical values, while 31 SLLs (13.7%) use KPIs that are at least partially quantifiable. Examples of KPIs treated as non-quantifiable include "*Auditing the human and labor rights in natural rubber processing plants*" (Nokian Tyres, 2019), and "*Establishment of governance policies, specifically anti-corruption*" (CapMan, 2021). While 67 SLLs without quantifiable KPIs is a significant share, this number is again triggered by missing KPI information in 23 cases and the use of ESG ratings, which are not deemed as fully quantifiable given the differences in calculation methodology and rating scales.

ESG ratings of the same provider can however be useful for benchmarking versus industry peers and therefore score points in the fourth dimension, benchmarking ability. The results suggest that only a low number of borrowers directly refer to a benchmark in their press releases on SLL issuance, but often more information can be obtained from sustainability reports of the borrower if KPIs are strategically relevant. Especially for GHG reduction targets, most borrowers have established science-based targets as a reference point: *"To progress its climate actions, Uponor announced on 7 December 2020 its commitment to UN Global Compact's campaign and the Science Based Targets initiative promising to pursue actions that limit the global temperature rise to 1.5°C. In alignment with this, both new loan arrangements have success KPIs that are tied to Uponor's greenhouse gas reduction targets." (Uponor, 2021). On the other hand, benchmarks for social objectives are rare, likely also driven by a lack of adequate benchmarks. 97 SLLs (43%) use fully benchmarked KPIs, 62 SLLs (27.4%) contain at least one benchmarkable KPI, and 67 SLLs (29.6%) are not benchmarked.* 

Regarding the pricing mechanism, 94 out of 226 SLLs (41.6%) specifically mention a malus system, i.e., a margin increase to penalize failure to reach sustainability targets. 79 SLLs (35%) state that the interest rate is linked to the performance against SPTs, but do not mention a penalty or state that the SLL contains a margin reduction only. For instance, the following example does not explicitly mention a margin penalty and thus does not provide sufficient information to confirm a malus system being present: *"The interest margin is linked, among other things, to the fulfillment of ESG criteria in the areas of environmental and climate protection, social commitment and corporate management"* (Telefonica Deutschland, 2019). 53 SLLs (23.4%) do not provide any information on the pricing mechanism. The lack of transparency regarding the incentive mechanism of SLLs is coherent with findings in previous research and has been linked to greenwashing concerns (e.g., Carrizosa & Ghosh, 2022; Kim et al., 2021).

Scores in the sixth dimension are the lowest overall, with 66 out of 226 (29.2%) of SLLs being subject to independent external reviews. This figure includes SLLs using ESG ratings as KPIs, as it is possible to argue ratings are entirely externally developed and scored. Rarely any information on external reviews is published for SLLs based on specific E, S, and G KPIs. As a result, 147 SLLs (65%) score zero points in this dimension, while 13 (5.8%) scored 0.5 points. While the true number of SLLs subject to an external review is unknown, it seems reasonable

to assume that it could be higher than the results suggest, due to low transparency and reporting efforts by borrowers.

#### [Figure B1]

In the next step, the overall KPI Scores per SLL are calculated by aggregating the scores of each dimension. Figure B2 reports the distribution of SLLs across all possible scores (ranging from 0 to 6). The lowest possible score of zero points was given to 18 SLLs, in all cases due to a lack of transparency and reporting rather than the actual KPI selection. In all 18 cases, I was able to verify the loan being issued as an SLL but did not find any KPI information despite extensive research. Loans scoring 0.5 or 1 point typically also lack KPI information, but information on an external review or pricing mechanism was published. The highest possible score of 6 points was reached by 9 loans, while an additional 4 loans scored nearly perfect at 5.5 points. 154 out of 226 SLLs (68%) obtained a score between 2.5 and 4.5, while the mode score was 3. Excluding all loans scoring zero points due to missing information, the scoring distribution resembles a negatively skewed bell curve. The sample has a mean score of 3.32 and a median of 3.5, which is somewhat higher than the results of Auzepy et al. (2022), who report a mean of 3.15 and a median of 3.0. Possible explanations for the observed differences include geographic and time-related sample differences, and a manual data collection and scoring process prone to human error and subjective evaluations. While the dataset used by Auzepy et al. (2022) includes SLLs from more European countries, the sample used for this thesis focuses on the Nordics, the UK, and Germany. In this context, Auzepy et al. (2022) report above-average scores for Finland, Denmark, and Germany in their study, which could indicate that the selected geographic focus leads to slightly higher average scores. Another explanation could be increasing scores over time, as this study includes data until 2022. Figure B3 displays average KPI scores per year and shows that the average score in fact slightly decreased in 2022 compared to previous years.

Figure B4 reports average scores per industry. The Technology sector exhibits the lowest average score (2.62 points) followed by Consumer Non-Cyclicals (2.98). The highest scores are achieved in Industrials (3.75), Basic Materials (3.65), and Real Estate (3.45). The fact that low-emitting sectors like Technology, Financials, and Healthcare tend to score lower than high-emitting sectors seems coherent with the observation that higher-emitting firms issue more green loans and bonds due to larger incentives to improve environmental performance (Flammer, 2021). As such, a greater focus on sustainability issues in these sectors might be reflected in SLL KPIs.

[Figure B2] [Figure B3] [Figure B4]

Despite some slight differences, the average total score results are overall aligned with the suggestion in previous studies, that many SLLs are not structured to effectively incentivize the achievement of relevant and material sustainability objectives. I find SLLs referring to a published sustainability-linked financing framework tend to score highest, as these frameworks typically closely follow the recommendations of the SLLP that my scoring methodology is based on. Therefore, it is possible to obtain information on five dimensions (for materiality the SASB materiality map is needed) from just one source. In contrast to many SLLs without reference to a sustainability-linked financing framework, these loans also tend to score well in dimensions 4, 5, and 6. In this light, it is surprising that only very few borrowers publish a sustainability-linked financing framework.

## 6 Event Study

## 6.1 Methodology

#### 6.1.1 General model specification

To investigate stock market reactions to SLL announcements, I first conduct a short-run event study on the full sample of 226 SLLs, followed by a second event study aimed at investigating whether investors differentiate between SLLs of high and low KPI quality. Event studies are a useful tool to examine the impact of an event on security prices as they combine two attractive features.

First, they entail a difference-in-difference like identification that compares observed returns of the event firm with an estimated "normal" price, i.e., a counterfactual that assumes the event did not occur. The normal price is estimated by regressing stock returns of the event firm on returns of a market benchmark in an estimation window prior to the event and using the regression outputs to predict the stock returns during the event window.

Second, event studies summarize the observed difference in a single sufficient statistic. In this case, this statistic is a firm's market capitalization, which is directly affected by changes in the share price. As the market capitalization reflects the net present value (NPV) of future cash flows, the change in market capitalization represents the gain or loss in NPV due to the event (Mattsson & Starrsjö, 2022).

The event study method used in this paper is closely related to the method applied by Flammer (2021), who conducts an event study on stock market reaction to the issuance of green bonds, and Kim et al. (2021), who investigate the stock market reaction to the announcement of sustainability-linked loan financing. One way in which my event study differs from Kim et al. (2021) is that I later focus on the impact of SLL KPI quality on stock market reaction.

I follow the four basic steps for conducting an event study lined out by Ball and Brown (1968) and Fama et al. (1969). First, I define the event date as the SLL announcement date, as all relevant information on the SLL facility is communicated to the public through the announcement (Flammer, 2021). On the facility start date, when deviating from the announcement date, no relevant information is conveyed to the market in the context of an event study. While facility start date and announcement date in the sample often fall on the same day, in several cases the announcement date significantly deviates from the facility start date. This observation has also been made by Kim et al. (2021), who report announcement dates up to six months after the facility start date. As the Eikon data only comprises facility start and maturity dates, I manually compile announcement dates while scrolling through press releases and news reports during the KPI data collection.

Second, the market model is specified as the model characterizing normal returns. According to Campbell et al. (1997), normal returns are the expected returns if the event did not take place. The chosen market model relies on the CAPM, which predicts  $R_{i\tau}$  as the return of company *i* in time  $\tau$ , based on its correlation with the observed market return  $R_{M\tau}$ , while assuming  $E[\varepsilon_{i\tau}] = 0$ .

$$R_{i\tau} = \alpha_i + \beta_i * R_{M\tau} + \varepsilon_{i\tau} \tag{1}$$

Regarding the selection of appropriate benchmarks for the market model, I again turn to the two most relevant papers for this event study. While Kim et al. (2021) use the MSCI All Country World Equity Index as wider benchmark for their global sample of SLLs, Flammer (2021) first uses country-specific indices in the context of green bonds but finds similar results when using a broad, international equity index. I thus decide to construct two different benchmarking options. Given that my sample consists of European loans only, the first option uses the MSCI Europe index as a wider benchmark. The second option uses 6 country-specific indices, namely the leading equity index of each country in the sample.

As such, I use the FTSE 100 for the UK, DAX 30/40 for Germany<sup>3</sup>, OMX Copenhagen 25 for Denmark, OMX Stockholm 30 for Sweden, OMX Helsinki 25 for Finland, and MSCI Norway for Norway.

The estimation window [-200, -21] ranges from 200 days prior to 21 days prior to the event and is intentionally selected to be out-of-sample to prevent parameter estimates from being influenced by the event (Flammer, 2021). Regression coefficients  $\alpha_i$  and  $\beta_i$  are estimated via ordinary least squares (OLS) in the estimation window.

Keeping with Flammer (2021), I select the event window [-5, 10] as a 16-day period ranging from 5 days prior to 10 days after the event. Following Krüger (2015), the inclusion of 5 days before the SLL announcement accounts for possible information leakage, while a 10-day period after the event accounts for the possibility of a staggered effect in the market reaction. To rule out that abnormal returns are driven by random events around the announcement date, I test four additional event windows defined as [-20, -11], [-10, -6], [2, 10], [11, 20].

Then the abnormal daily returns  $\widehat{AR}_{i\tau}$  for each SLL are calculated by subtracting the estimated normal daily return from the observed daily return  $R_{i\tau}$ .

$$\widehat{AR}_{i\tau} = R_{i\tau} - \widehat{\alpha}_i - \widehat{\beta}_i R_{m\tau}$$
<sup>(2)</sup>

Subsequently, daily abnormal returns are aggregated through time to receive cumulative abnormal returns (CAR). The CAR is obtained by summing each borrower's daily returns in the event window.

$$\widehat{CAR}_{i}(\tau_{1},\tau_{2}) = \sum_{\tau_{1}}^{\tau_{2}} \widehat{AR}_{i\tau}$$
(3)

As I would like to evaluate the average stock market reaction across all loan announcements, I then calculate the cumulative average abnormal return  $\overline{CAR}(\tau_1, \tau_2)$  by taking the mean of all CARs in the sample.

$$\overline{CAR}(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^{n} \widehat{CAR}(\tau_1, \tau_2)$$
(4)

Using the cross-section of cumulative abnormal returns, I calculate the variance  $Var\left[\widehat{CAR}(\tau_1, \tau_2)\right]$  from the mean. An important assumption here is that the cross-section of CARs needs to be uncorrelated for the variance to be consistent (Campbell et al., 1997).

<sup>&</sup>lt;sup>3</sup> The number of constituents in Germany's leading market index DAX was changed from 30 to 40 on 20 September 2021 (Scholtes, 2021).

A violation of this assumption would typically be suspected if more than one SLL announcement happened on a single date. My sample contains 18 dates where two SLL announcements occurred and one date where three SLL announcements occurred. However, on 18 out of 19 days, the SLL announcing companies were from different industries, so the market model should reduce intercorrelations of abnormal returns (Brown & Warner, 1985). In one case, the two Finnish Industrial companies Metso Outotec and Kone announced SLL facilities on the same day.<sup>4</sup> Hence, a slight intercorrelation of abnormal returns might persist in the data. In this case, the use of a country-specific index for Finland should at least partially reduce the assumed correlation.

$$Var\left[\widehat{CAR}(\tau_1,\tau_2)\right] = \frac{1}{N} \sum_{i=1}^{n} (\widehat{CAR}(\tau_1,\tau_2) - \overline{CAR}(\tau_1,\tau_2))^2$$
(5)

Lastly, a hypothesis test to check the results for robustness is carried out. I use a two-tailed ttest and specify the null hypothesis as the average CAR being equal to zero. The t-statistic is defined as:

$$t = \sqrt{N} \frac{\overline{CAR}(\tau_1, \tau_2)}{(Var[\overline{CAR}(\tau_1, \tau_2)])^{\frac{1}{2}}}$$
(6)

The selected model relies on a few important assumptions. First, I assume the model estimating normal returns is well-specified, meaning that in the absence of SLL announcements, the return of the event firm should be close to the normal return. The robustness of the market model is tested by comparing the results of two different benchmarking approaches, one using the MSCI Europe as a broad market index, and one using six country-specific indices. Second, the risk that relevant information has been transmitted into the market before the event date persists. I thus select the event window to include five days prior to the event to control for potential information leakage. Last, the model must account for the possibility that not all relevant information might be instantly transmitted into stock prices. Following the recommendation in the literature to allow for a staggered response (Flammer, 2021), I thus include 10 days after the event date.

<sup>&</sup>lt;sup>4</sup> Using TRBC as sector classification both German Covestro AG and Finnish UPM Oyj belong to the Basic Materials sector. Under different classifications, Covestro AG is classified as Chemicals, while UPM is classified as Forestry, Pulp & Paper. Hence, given different economic activities intercorrelations are assumed to be reduced.

#### 6.1.2 Model incorporating KPI quality

Apart from using the above methodology to perform an event study on the full sample and separately on first-time and subsequent (repeated) borrowers, I want to investigate the impact of KPI quality on cumulative abnormal returns. Therefore, four different loan portfolios are constructed based on the total KPI score previously assigned. Using a percentage ranking function, I obtain four quartile portfolios Q1, Q2, Q3 and Q4 with decreasing KPI quality. Hence, Q1 contains SLLs of the highest KPI quality (total scores 5, 5.5, and 6), while Q4 contains SLLs of the lowest KPI quality Total Scores (0, 0.5, 1, 1.5). Table 1 reports the average scores of each quartile portfolio across the scoring dimensions.

Table 1. Average KPI score of sub-portfolios across scoring dimensions

Sub-portfolio	# of SLLs	Avg Market Cap (EURm)	Total Score	Strategic relevance	Materiality	Measurability	Benchmarking ability	Pricing mechanism	External review
Q1	37	16,773,225	5.30	1.00	0.91	0.95	0.78	0.91	0.68
Q2	56	6,500,567	4.23	0.94	0.74	0.90	0.72	0.62	0.14
Q3	73	8,728,974	3.20	0.58	0.38	0.60	0.55	0.64	0.36
Q4	60	6,813,975	1.41	0.23	0.11	0.23	0.30	0.31	0.23

*Note:* This table reports the average market capitalization alongside the average total and dimensional KPI score of each sub-portfolio. Sub-portfolios Q1 - Q4 are constructed based on a percentage ranking function applied to the Total KPI Score of all 226 SLL announcements in the sample.

Next, for the constituents of each quartile portfolio Q1 – Q4, I get the previously calculated cumulative abnormal returns  $\widehat{CAR}_i(\tau_1, \tau_2)$  in the event window [-5, 10]. I then calculate the cumulative average abnormal returns  $\overline{CAR}(\tau_1, \tau_2)$  for Q1 – Q4 and check the results for robustness using a two-tailed t-test with the null hypothesis of abnormal returns equaling zero. This practice is repeated for four additional event windows [-20, -11], [-10, -6], [2, 10], [11, 20]. Based on signaling theory and the findings of Kim et al. (2021) that CARs of high-transparency loans are positive and significant while CARs of low-transparency loans are small or negative and insignificant, I would expect a higher average CAR for the loan portfolios of higher KPI quality compared to lower KPI quality portfolios. Therefore, decreasing average CARs going from Q1 to Q4 are expected.

To see whether the expected difference in average CARs of Q1 - Q4 is statistically significant, I test the results using a Welch two-sample t-test. The null hypothesis is specified as the true difference in average CARs being equal to zero. The t-statistic is defined as:

$$t = \frac{\overline{(CAR_i(\tau_1,\tau_2) - \overline{CAR_j}(\tau_1,\tau_2))}}{\sqrt{\frac{Var\left[CAR_i(\tau_1,\tau_2)\right]}{n_i} + \frac{Var\left[\overline{CAR_j}(\tau_1,\tau_2)\right]}{n_j}}}$$
(7)

The robustness test is carried out on three combinations of quartile portfolios, namely Q1 and Q2, Q1 and Q3, and Q1 and Q4. One potential issue with the robustness test is related to the small sample size of the quartile portfolios, as the smallest sample contains only 37 SLLs. A central assumption of the two-sample test is a normal distribution of returns. Following Mattsson and Starrsjö (2022), I assume normality as the central limit theorem holds for sample sizes above 30.

#### 6.2 Event study results

First, average CARs are estimated on the full sample of 226 SLLs using the MSCI Europe as a benchmark. Results are reported in the left panel of Table 2. In the event window [-5, 10], I find a positive average CAR of 0.84% which is significant at the 10% level. Average CARs for controlling event windows are mostly negative or negligible and statistically insignificant, indicating that the positive average CAR is not driven by random events but likely by the announcement of SLL financings. In the event window [2, 10] a positive but insignificant average CAR of 0.56% is obtained.

Using country-specific indices as a benchmark, I find very similar results of positive average CARs around the event date but negative or negligible CARs in the controlling event windows. The average CAR of 0.72% for the event window [-5, 10] is however not significant at the 10% level. Results for the country-specific method are reported in the right panel of Table 2.

	Benchmark: MSCI Europe		Benchmark: Country-specific ir	
Event window	CAR (%)	Std. err.	CAR (%)	Std. err.
[-20, -11]	-0.448	0.363	-0.301	0.342
[-10, -6]	-0.385	0.247	-0.338	0.244
[-5, 10]	0.837*	0.478	0.722	0.479
[2, 10]	0.564	0.353	0.568	0.345
[11, 20]	0.009	0.356	-0.001	0.331
Nobs.	22	26	22	26

Table 2. Stock market reaction to the announcement of SLL financing

*Note:* This table reports the average CAR as a percentage for different event windows around the SLL announcement date. CARs are calculated using two different market models, the MSCI Europe index (left) and 6 country-specific indices (right). The sample consists of 226 SLL announcements. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

While the use of country-specific indices might be preferred over a wider benchmark due to the reduction in country-specific intercorrelation of CARs, the higher statistical significance obtained by using the latter induces me to continue the event study with the MSCI Europe as the benchmark.

Next, I investigate the difference in average CARs for companies announcing SLL financing for the first time (first-time borrowers) and companies announcing their second or third SLL facility (subsequent borrowers). The sample of 226 SLLs comprises 185 first-time announcements and 41 subsequent announcements. Table 3 reports an average CAR of 0.92% for first-time borrowers in the [-5, 10] event window, which is significant at the 10% level (p = 0.0903). The average CAR of subsequent borrowers is insignificant and lower at 0.47%. While the results would generally support the conclusion that the signaling effect for first-time announcements is larger than for subsequent announcements, a Welch two-sample t-test does not provide a sufficient p-value to reject the null hypothesis of the true difference in average CARs being equal to zero.

	First-time borrowers		Subsequent	borrowers
Event window	CAR (%)	Std. err.	CAR (%)	Std. err.
[-5, 10]	0.918*	0.539	0.471	1.029
Nobs.	18	35	4	1

**Table 3.** Stock market reaction to the announcement of SLL financing for firsttime borrowers compared to subsequent borrowers

*Note:* This table reports the average CAR for first-time borrowers and subsequent borrowers in the event window [-5, 10]. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4 reports the average CARs for the quartile portfolios Q1 to Q4 that were constructed based on the total KPI Score calculated in section 5 of this paper. In line with expectations, the results suggest that the loan portfolio consisting of SLLs with the highest KPI quality, Q1, exhibits the highest average CAR. In the event window [-5, 10], I find an average CAR of 2.86% which is significant at the 10% level (p = 0.0706).

Table 4. SLL KPI quality and stock market reaction to the announcement of SLL financing

	Ç	01	Ç	2	Ç	23	Q	24
Event window	CAR (%)	Std. err.						
[-20, -11]	-1.659	1.245	-0.056	0.718	0.264	0.530	-0.931	0.647
[-10, -6]	-0.928	0.650	0.642	0.432	0.690	0.455	-0.639	0.472
[-5, 10]	2.860*	1.535	-0.397	0.807	0.947	0.743	0.609	0.976
[2, 10]	1.256	1.110	-0.356	0.561	0.892	0.567	0.598	0.747
[11, 20]	0.433	0.816	-0.571	0.751	0.411	0.610	-0.198	0.723
Nobs.	3	7	5	6	7	3	6	0

*Note:* This table reports the average CAR as a percentage for different event windows around the SLL announcement date. CARs are reported for quartile portfolios Q1-Q4, which are constructed according to KPI scores. Q1 contains the highest-scoring SLLs, while Q4 contains the lowest-scoring SLLs. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Surprisingly, SLL portfolio Q2, i.e., the portfolio of the second highest KPI quality, had a negative average CAR of -0.4% and thus the lowest out of all four quartile portfolios. Unfortunately, none of the average CARs estimated for Q2, Q3, and Q4 are statistically significant at the 10% level. An average CAR of 0.95% is obtained for Q3, thus slightly higher than the 0,61% reported for Q4. Despite the results being insignificant, it is surprising that Q4 exhibits a positive average CAR since 23 SLLs without public disclosure of KPI information are part of this portfolio. Following the observations of Kim et al. (2021), I was expecting that these low-transparency loans would have a lower to negative average CAR.

To check the results in Table 4 for robustness, I subsequently create sub-portfolios using the sample of 185 first-time borrowers only and run the same event study again. Given the higher significance of the average CAR for first-time borrowers previously reported in Table 3, I also hoped for more significant results across KPI quality sub-portfolios. Results are however similar to the full sample results, and again only the [-5, 10] average CAR of sub-portfolio Q1 is significant at the 10% level (CAR 3.43% with p = 0.0848), while significance is slightly lower than before. Hence, I continue the rest of the analysis with the full sample.

Finally, the difference in average CARs is calculated between Q1 as the high KPI quality portfolio and the remaining lower quality portfolios Q2, Q3, and Q4, followed by a Welch two-sample t-test to check the results for robustness. Table 5 reports the results for different windows around the event date.

I find that only the largest CAR difference of 3.26% between portfolios Q1 and Q2 is significant at the 10% level (p = 0.0656). Nevertheless, for CAR differences Q1-Q3 and Q1-Q4, p-values are more significant in the actual event window [-5, 10] than for any of the controlling windows. Despite not reaching a sufficient significance level, this observation indicates that SLL announcements most likely have an influence on return differentials in the quartile portfolios. As I obtain a significant negative CAR difference between Q1 and Q2 in the controlling window [-10, -6], I run an additional robustness test to control for the influence of random events before the actual event window. Using [-10, 10], the Q1-Q2 CAR difference of both portfolios is positive at 1.69% but statistically insignificant (p-value = 0.3977), indicating that the return difference in the event window is not driven by random events before the announcement date.

	Q1 - (	Q2	Q1 - 0	23	Q1 - (	24
Event window	CAR difference	p-value	CAR difference	p-value	CAR difference	p-value
[-20, -11]	-1.603	0.269	-1.923	0.162	-0.728	0.606
[-10, -6]	-1.570**	0.048	-1.618	0.764	-0.289	0.719
[-5, 10]	3.257*	0.065	1.913	0.267	2.251	0.220
[2, 10]	1.612	0.200	0.364	0.771	0.658	0.624
[11, 20]	1.004	0.368	0.022	0.982	0.631	0.564

Table 5. The difference in abnormal returns between sub-portfolios of varying KPI quality

*Note:* This table reports the difference in average CARs in percentage points for different event windows around the announcement date. Differences in average CARs are obtained by subtracting average CARs of SLL portfolios Q2, Q3, and Q4 (lower KPI quality) from SLL portfolio Q1 (highest KPI quality). The results are checked for robustness using a Welch two-sample t-test and p-values are reported alongside the CAR difference. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 7 Discussion

In the first part of this thesis, significant differences regarding borrower transparency on KPIs and the KPI quality itself are noted across SLLs. As a matter of fact, I conclude that SLLs are not all the same, but differ widely regarding the effectiveness of incentivization and purposefulness. While this result is not a very positive one for SLLs in general, it encourages an analysis of stock market reactions to SLLs of different KPI qualities in the second part of this thesis.

Overall, the results of the KPI analysis are largely in line with the results of Auzepy et al. (2022), which is not surprising for two reasons: First, I used the same scoring methodology, and second, our datasets historically and geographically overlap to a large degree. The mean total score of 3.32 (on a scale from 0 to 6) however indicates that SLLs on average do not closely follow the recommendations of the SLLP. Most concerning from my point of view is a common selection of financially immaterial KPIs from an industry perspective (Dimension 2) and even more so the limited information available on the pricing mechanism (Dimension 5) and external review (Dimension 6). While these observations are similar to those of Auzepy et al. (2022), there are also small differences in the scoring distribution. These are likely rooted in a narrower geographic focus of my sample, the inclusion of SLLs issued in 2022, and the fact that the manual and research-intensive scoring process is prone to subjective evaluations and human error. In contrast to the observation of increasing KPI quality over time made by Auzepy et al. (2022), my results surprisingly suggest a lower KPI quality for 2022 than for 2021. An increasing score was expected due to lenders getting more and more experienced in SLL coordination and increasing awareness of potential greenwashing issues related to KPI selection (International Financial Review, 2021).

Similar to most empirical work on SLLs, a potential issue relates to the small sample size, where generalization might lead to inaccurate conclusions at times. As research in the field of SLLs is still in its infancy and new SLL data becomes available over time, I believe future studies on a larger sample could be very value-adding.

In the second part of this thesis, I find evidence that the announcement of SLL financing leads to a positive stock market reaction. While first-time SLL borrowers exhibit a positive cumulative average abnormal return, there is no statistically significant evidence indicating that also subsequent SLL announcements lead to abnormal returns. This observation is in line with the results of Mattsson & Starrsjö (2022) in the context of sustainability-linked bond issuance and connects to the signaling effect of sustainable debt. Once a company has conveyed its commitment to sustainability objectives credibly to the public through a first SLL announcement, a later refinancing conveys limited new information, and a continued sustainability link might be expected as the new normal for this borrower.

Dividing the full sample into 4 sub-portfolios ranked by KPI quality, I find that only the SLL portfolio of the highest KPI quality exhibits statistically significant abnormal returns. These returns are quite sizable at 2.9%, although likely driven by a small sample size of 37 SLLs. In contrast, the average CARs of lower-quality sub-portfolios are smaller or negative and insignificant. Consequently, the results can be seen as evidence that investors only react positively to SLL announcements conveying a credible commitment to sustainability improvements. On the other hand, the results do not provide any evidence that the announcement of low-quality or untransparent SLLs is viewed negatively by the market.

The latter result seems rather surprising as I expected to see a more alert market reaction in the light of greenwashing concerns, for instance resulting in a negative CAR of the lowest quality portfolio. However, the results obtained are comparable to Kim et al. (2021), who do not find significant abnormal returns for low-transparency SLLs in a larger sample compared to the one in this thesis.

Interestingly, I find the largest difference between the cumulative average abnormal returns of SLL portfolios with the highest and second highest KPI quality. As the difference is statistically significant at the 10% level, it is possible that already small shortfalls versus SLLP recommendations are noticed by market participants. Comparing the main differences in KPI score components of the two sub-portfolios, one can see that the scoring difference is largely driven by the fifth and sixth dimensions, i.e., pricing mechanism and external review.

Several limitations to this thesis are worth highlighting. While the loan data obtained from Eikon generally seems to be in line with market size estimates from other data providers, it contained several cases where loans were falsely classified as SLLs. Although I manually verified every SLL in the sample of publicly listed firms, it is not possible to rule out potential inaccuracies in the estimation and delineation of the European SLL market.

A main limitation connected to data quality concerns the announcement date of SLL financing used in the event study. As Eikon does not provide an announcement date through the market screening function, I manually gathered announcement dates from press releases and popular news sources. Despite cross-checking different announcement mediums, there remains some uncertainty when the relevant information is communicated to the market. As such, some borrowers reference previously published sustainability-linked financing frameworks in their SLL announcements. I believe that as the framework on its own is not a commitment to sustainability targets, the announcement by the borrower that SLL financing was obtained remains the relevant event.

Regarding the framework used to assess the KPI quality of loans, it must be assumed that other factors influence the quality of SLLs that are not entirely captured by the approach used in this thesis. As such, a study by Carrizosa & Ghosh (2022) indicates that CARs to SLL announcements vary with the magnitude of margin adjustments. However, as quantitative information on basis point adjustments is usually not publicly available, this information is not included in my scoring process.

Lastly, like most studies thus far on SLLs, this thesis likely suffers from a small sample size. As more and more data on SLL financing becomes available over time, future research has the possibility to include newer data points and expand the geographic extent to increase the sample size. The results presented in this thesis call for future research, especially as the SLL market gets larger, and SLL financing might eventually become the new mainstream. Thus, the market perception of SLL announcements and the determinants of good and bad KPIs might change over time.

## 8 Conclusion

This thesis adds to the growing literature on sustainability-linked loans. I start by providing descriptive statistics on the European SLL market and delineate SLL borrowing from use-of-proceeds financing in the European market for green loans. Highlighting differences in market size, borrower types, and loan characteristics, I find that SLL borrowing is used by borrowers from a wider range of industries, while green loans are more concentrated on the Utility and Renewable Energy sectors. Moreover, the general-purpose eligibility of SLL proceeds translates into a higher share of revolving credit facilities and fewer term loans, especially among listed borrowers.

For a sample of listed firms in the UK, Germany, and the Nordics, I then analyze SLL KPIs. While many SLLs relate to several KPIs and comprise social objectives or ESG ratings, environmental KPIs, such as GHG reduction or energy efficiency, are the most used. Applying a scoring framework based on the Sustainability-linked Loan Principles to evaluate KPI quality, I find similar to previous studies that SLLs vary significantly in KPI quality. While most borrowers align KPIs with their sustainability strategies and use quantifiable metrics, KPIs are often not material from an industry perspective and lack transparency regarding pricing incentives and external review.

I then analyze the stock market reaction to SLL announcements and establish a link to KPI quality. The results suggest that the stock market generally reacts positively to SLL announcements. Supporting a signaling effect of sustainable debt, this reaction is stronger for first-time borrowers, while only being insignificant for subsequent borrowers. Constructing sub-portfolios based on KPI quality, I find that SLLs of the highest quality exhibit the highest abnormal returns in the event study, while lower-quality SLLs do not show significant abnormal returns. Consequently, the results provide evidence that investors only react positively to SLL announcements conveying a credible commitment to sustainability improvements. On the other hand, there is no evidence that the announcement of low-quality or nontransparent SLLs is followed by a negative market reaction. Finally, the results seem to indicate that investors already react to minimal shortcomings in alignment with the SLLP.

The evolution of sustainable debt financing in the past 10 years has been marked by significant growth in both use-of-proceeds and performance-based financing. SLLs are still a relatively new addition in this sphere and many questions for further research remain. As such, rationales for issuing SLLs might change over time, and with that could the public perception of SLLs as a sustainable financing alternative. As more data becomes available, it would be interesting to see to what extent borrowers achieve their SPTs and which KPIs might be more easily achieved compared to others. Here, one could also compare listed borrowers with other areas where SLLs are increasingly used, e.g., in Leveraged Buyouts. Furthermore, the methodology used to evaluate the quality and effectiveness of SLLs could be subject to changes and the addition of new dimensions. One aspect to add could be a quantifiable variable to capture incentivization through margin adjustments.

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## Appendix A – Market Overview

#### 1. Descriptive statistics on the European SLL and GL markets

Country	Number of SLLs	Percentage of SLLs	SLL Volume (in EURbn)
Spain	209	17.2%	83.3
France	208	17.1%	146.2
United Kingdom	163	13.4%	98.1
Germany	146	12.0%	99.9
Italy	105	8.6%	74.2
Netherlands	73	6.0%	66.4
Finland	47	3.9%	14.8
Sweden	42	3.5%	33.3
Norway	31	2.6%	21.7
Switzerland	30	2.5%	22.6
Belgium	29	2.4%	20.5
Austria	27	2.2%	8.2
Denmark	23	1.9%	19.4
Luxembourg	23	1.9%	17.3
Other	59	4.9%	27.4
Total	1215	100.0%	753.2

Table A1. Sustainability-linked loans by borrower country.

*Note:* This table reports the number of SLL facilities and SLL volume by the borrower's country of incorporation. The Percentage of SLLs is calculated by dividing the number of SLLs in each country by the total number of SLL facilities in the sample. A total of 1215 SLL facilities were issued in Europe from 2016 to 2022.

Country	Number of GLs	Percentage of GLs	GL Volume (in EURbn)
Spain	141	29.1%	30.2
United Kingdom	69	14.3%	44.5
France	57	11.8%	18.8
Italy	55	11.4%	10.9
Germany	28	5.8%	19.0
Sweden	22	4.5%	8.1
Netherlands	18	3.7%	4.7
Finland	13	2.7%	3.3
Luxembourg	13	2.7%	5.1
Portugal	10	2.1%	4.2
Poland	8	1.7%	0.6
Norway	7	1.4%	0.6
Austria	6	1.2%	1.5
Denmark	6	1.2%	1.2
Other	31	6.4%	5.9
Total	484	100.0%	158.6

 Table A2. Green loans by borrower country

*Note:* This table reports the number of GL facilities and GL volume by the borrower's country of incorporation. The Percentage of GLs is calculated by dividing the number of GLs per country by the total number of GLs in the sample. A total of 484 GL facilities were issued in Europe from 2016 to 2022.

Industry	Number of GLs	Percentage of GLs	GL Volume (in EURbn)
Utilities	185	38.2%	66.4
Real Estate	74	15.3%	14.6
Industrials	70	14.5%	29.4
Financials	61	12.6%	16.7
Energy	29	6.0%	13.2
Consumer Cyclicals	24	5.0%	5.5
Basic Materials	16	3.3%	6.2
Consumer Non-Cyclicals	9	1.9%	2.1
Government Activity	7	1.4%	1.6
Technology	5	1.0%	2.0
Healthcare	4	0.8%	0.9
Total	484	100.0%	158.6

#### Table A3. Green loans by industry

*Note:* This table reports the number of GL facilities and the GL volume per industry using TRBC (The Refinitiv Business Classifications) sector definitions. The Percentage of GLs is calculated by dividing the number of GLs in each industry divided by the total number of GL facilities in the sample. A total of 484 GL facilities were issued in Europe from 2016 to 2022.

Industry	Number of SLLs	Percentage of SLLs	SLL Volume (in EURbn)
Industrials	247	20.3%	150.6
Consumer Cyclicals	171	14.1%	81.6
Consumer Non-Cyclicals	130	10.7%	77.9
Basic Materials	129	10.6%	64.4
Financials	125	10.3%	79.6
Utilities	122	10.0%	109.2
Real Estate	100	8.2%	31.8
Technology	84	6.9%	68.2
Healthcare	55	4.5%	30.5
Energy	43	3.5%	57.8
Academic & Educational Services	5	0.4%	0.2
Government Activity	3	0.2%	1.1
Institutions, Associations & Organizations	1	0.1%	0.2
Total	1215	100.0%	753.2

Table A4. Sustainability-linked loans by industry

*Note:* This table reports the number of SLL facilities and SLL volume by industry using TRBC (The Refinitiv Business Classifications) sector definitions. The Percentage of SLLs is calculated by dividing the number of SLLs in each industry by the total number of SLL facilities in the sample. A total of 1215 SLL facilities were issued in Europe from 2016 to 2022.

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Use of proceeds	Number of SLLs	Percentage of SLLs	SLL Volume (in EURbn)
General Corporate Purposes	920	75.7%	591.7
Refinancing / Repayment of bank liabilities	63	5.2%	53.7
Leveraged Buyout	53	4.4%	22.1
Acquisition Finance	44	3.6%	20.0
Project Finance	35	2.9%	24.7
Real estate acquisition	30	2.5%	3.7
Working Capital	28	2.3%	26.3
Capital expenditure	23	1.9%	5.1
Aircraft & Ship Finance	12	1.0%	2.3
Management buyout	2	0.2%	1.2
Other	5	0.4%	2.4
Total	1215	100.0%	753.2

*Note:* This table reports the number of SLL facilities and the SLL volume by use of proceeds. The Percentage of SLLs is calculated by dividing the number of SLLs for each issuance purpose by the total number of SLL facilities in the sample. A total of 1215 SLL facilities were issued in Europe from 2016 to 2022.

Use of proceeds	Number of GLs	Percentage of GLs	GL Volume (in EURbn)
Project Finance	229	47.3%	89.7
General Corporate Purposes	129	26.7%	29.1
Real estate acquisition	46	9.5%	6.6
Capital expenditure	36	7.4%	9.6
Acquisition Finance	19	3.9%	16.0
Refinancing / Repayment of bank liabilities	8	1.7%	2.5
Aircraft & Ship Finance	6	1.2%	1.7
Leveraged Buyout	5	1.0%	1.3
Working Capital	4	0.8%	0.7
Other	2	0.4%	1.4
Total	484	100.0%	158.6

#### Table A6. Green loans by use of proceeds

*Note:* This table reports the number of GL facilities and the issuance volumes by use of proceeds. The Percentage of GLs is calculated by taking the number of GLs for each issuance purpose by the total number of GL facilities in the sample. A total of 484 GL facilities were issued in Europe from 2016 to 2022.

Loan product	Number of SLLs	Percentage of SLLs	SLL Volume (in EURbn)
Revolver	793	40.6%	502.6
Term Loan	678	34.7%	147.5
Schuldschein	244	12.5%	18.0
Other Loan	160	8.2%	51.4
Capex Facility	39	2.0%	6.7
Guarantee	19	1.0%	20.9
Acquisition Facility	7	0.4%	0.2
Letter of Credit	5	0.3%	1.5
Bridge Loan	4	0.2%	3.3
VAT Loan	3	0.2%	0.0
Debt restructure	2	0.1%	0.0
Export credit	1	0.1%	1.2
Total	1955	100.0%	753.3

Table A7. Sustainability-linked loans by loan product

*Note:* This table reports the number of SLL tranches and SLL tranche volume by loan product. The Percentage of SLLs is calculated by dividing the number of SLL tranches per loan product by the total number of SLL tranches in the sample. Note that, the total number of 1955 SLL tranches is larger than the total number of 1215 SLL facilities, as several tranches are typically combined in a single facility.

Loan product	Number of GLs	Percentage of GLs	GL Volume (in EURbn)
Term Loans	417	43.9%	82.2
Other Loan	201	21.2%	34.7
Revolver	175	18.4%	17.7
Schuldschein	55	5.8%	4.0
Letter of Credit	23	2.4%	1.3
Guarantee	20	2.1%	1.3
VAT loan	18	1.9%	0.4
Bridge Loan	12	1.3%	11.7
Capex Facility	12	1.3%	3.2
Debt restructure	11	1.2%	0.4
Export Credit	5	0.5%	1.5
Acquisition facility	1	0.1%	0.2
Total	950	100.0%	158.6

#### Table A8. Green loans by loan product

*Note:* This table reports the number of GL tranches and GL volume by loan product. The Percentage of GLs is calculated by taking the number of GL tranches for each loan product by the total number of GL tranches in the sample. Note that the total number of 950 GL tranches is larger than the total number of 484 GL facilities, as several tranches are typically combined in a single facility.

#### 2. Descriptive statistics on the sample of publicly listed firms

Country	Number of SLLs	Percentage of SLLs	SLL Volume (in EURbn)
United Kingdom	85	34.3%	60.5
Germany	70	28.2%	65.9
Finland	37	14.9%	11.6
Sweden	25	10.1%	19.5
Norway	19	7.7%	15.4
Denmark	12	4.8%	12.2
Total	248	100.0%	185.2

#### Table A9. Listed firm sample - sustainability-linked loans by borrower country

*Note:* This table reports the number of SLL facilities and SLL volume by the borrower's country of incorporation. The Percentage of SLLs is calculated by taking the number of SLLs in each country by the total of 248 SLL facilities in the sample.

Table A10. Listed firm sample - sustainability-linked loans by industry

Industry	Number of SLLs	Percentage of SLLs	SLL Volume (in EURbn)
Industrials	45	18.1%	31.9
Consumer Cyclicals	41	16.5%	31.2
Basic Materials	38	15.3%	24.4
Consumer Non-Cyclicals	26	10.5%	16.1
Technology	24	9.7%	16.8
Real Estate	24	9.7%	6.2
Financials	17	6.9%	10.2
Utilities	16	6.5%	21.2
Energy	10	4.0%	21.9
Healthcare	7	2.8%	5.3
Total	248	100.0%	185.2

*Note:* This table reports the number of SLL facilities and SLL volume by industry using TRBC (The Refinitiv Business Classifications) sector definitions. The Percentage of SLLs is calculated by dividing the number of SLLs in each industry by the total of 248 SLL facilities in the sample.

Use of proceeds	Number of SLLs	Percentage of SLLs	SLL Volume (in EURbn)
General Purpose	219	88.3%	171.3
Refinancing	17	6.9%	9.7
Acquisition	3	1.2%	2.7
Capital expenditure	2	0.8%	0.3
Project Finance	2	0.8%	0.2
Real estate loan	2	0.8%	0.2
Ship finance	2	0.8%	0.2
Working capital	1	0.4%	0.6
Total	248	100.0%	185.2

Table A11. Listed firm sample - sustainability-linked loans by use of proceeds

*Note:* This table reports the number of SLL facilities and SLL volumes by use of proceeds. The Percentage of SLLs is calculated by dividing the number of SLLs for each issuance purpose by the total of 248 SLL facilities in the sample.

Loan type	Number of SLLs	Percentage of SLLs	SLL Volume (in EURbn)
Revolver	198	56.9%	154.7
Schuldschein	75	21.6%	5.8
Other Loan	25	7.2%	6.6
Term Loan	46	13.2%	15.2
Guarantee	4	1.1%	2.8
Total	348	100.0%	185.2

Table A12. Listed firm sample - sustainability-linked loans by loan product

*Note:* This table reports the number of SLL tranches and the tranche volumes by loan product. The Percentage of SLLs is calculated by dividing the number of SLL tranches for each loan product by the total number of SLL tranches in the sample. Note that the total number of 348 SLL tranches is larger than the total number of 248 SLL facilities, as several tranches are typically combined in a single facility.

Number of KPIs	Number of SLLs	% of SLLs
no information	23	10.2%
1	71	31.4%
2	60	26.5%
3	64	28.3%
4	8	3.5%
Total	226	100.0%

Table B1. Sustainability-linked loans by number of KPIs

*Note:* This table reports the number of SLL facilities linked to 1, 2, 3, or 4 KPIs. For 23 SLLs, no KPI information was obtained, hence it is not possible to specify the exact number of KPIs agreed upon in the loan documentation.

Table B2. KPI overview by sustainability theme and category

Category	Number of KPIs	% of KPIs
Environmental	258	63.7%
Greenhouse gas emissions	140	34.6%
Energy consumption and energy efficiency	23	5.7%
Circular economy	22	5.4%
Renewable energy	20	4.9%
Sustainable resources and responsible procurement	20	4.9%
Environmentally sustainable investments	15	3.7%
Water Consumption	8	2.0%
Reduction and elimination of waste	6	1.5%
Biodiversity	4	1.0%
Social	95	23.5%
Employee diversity and gender equality	28	6.9%
Employee health and safety	25	6.2%
Sustainable products and customer benefits	22	5.4%
Social responsibility and community engagement	15	3.7%
Employee training	5	1.2%
Governance	3	0.7%
Business ethics	3	0.7%
ESG	49	12.1%
ESG rating	44	10.9%
Other ESG assessments or certification	5	1.2%
Total	405	100.0%

*Note:* This table reports the number and share of KPIs by sustainability theme. Each sustainability theme is assigned to one of four categories: Environmental, Social, Governance, and ESG. The classification follows Auzepy et al. (2022) and the total number of KPIs is 405.



Figure B1: Number of SLLs scoring 0, 0.5, and 1 point by scoring dimension.



Figure B2: Number of SLLs per total KPI Score.



Figure B3: Average KPI Score per Year



Figure B4: Average KPI Score per Industry

## **Appendix C – KPI collection and scoring examples**

This section contains background information on the manual KPI collection and scoring process for each of the six scoring dimensions. All examples are SLLs taken from the sample of listed borrowers and scored full points (1) in the respective dimension.

## **Dimension 1 – Strategic relevance**

Borrower:	Dunelm Group plc (LSE:DNLM)
Country:	UK
Industry:	Consumer Cyclicals
Announcement date:	2021-12-10

<u>Step 1:</u> In this case, SLL-specific KPI information is obtained from the borrower's press release (Dunelm Group plc, 2021):

The RCF incorporates four sustainability-linked performance targets which align with our ambitious sustainability plans including our commitment to pursue a Net Zero Pathway. These include annual targets which support delivery of the following long term objectives:

 50% reduction in Dunelm's greenhouse gas emissions by 2030 against a 2019 base, in line with the Science Based Targets Initiative 1.5 degrees scenario;

All own brand cotton products to meet Dunelm's 'More Responsibly Sourced' standard by 2025;

• 20% reduction in plastic packaging of own brand products by 2024; and

• Provision of a customer take-back service for 50% of our products by 2024.

Image taken from Dunelm Group plc press release, 2021-12-10

The press release refers to the borrower's sustainability plan and a "Net Zero Pathway" program, indicating that the KPIs derive from corporate sustainability goals. Nevertheless, in the second step, I check whether the KPIs relate to sustainability goals in corporate strategy documents like integrated reports or in sustainability information on the borrower's website.

<u>Step 2:</u> To confirm the strategic relevance of KPIs, I now compare the KPIs and corporate sustainability goals. In the Dunelm case, I find that all four KPIs are explicit sustainability goals and part of the borrower's strategy according to the sustainability website of Dunelm (Dunelm Group plc, 2023). Therefore, the SLL scores full points in the first dimension.

	Base year	Target
PATHWAY TO ZERO SCOPE 1		
Scope 1 CO <sub>2</sub> e	FY19	50% reduction by 2030
RESPONSIBLE SOURCING		
% of 'More Responsibly Sourced Cotton' in own brand range LTIP Q RCF Q	-	80% by FY24 and 100% by FY25
PLASTIC AND PACKAGING Volume of own brand plastic packaging used/£m sales	FY20	Reduce by #7.5% by FY22 and by 20% by FY24
TAKE-BACK         % of own brand products for which we offer an easy-to-use take-back service         LTIP       RCF         RCF       RCF	N/A	50% by FY24

Images taken from Dunelm's corporate sustainability website

## **Dimension 2 – Materiality**

Borrower:	RWE AG (XTRA:RWE)
Country:	Germany
Industry:	Utilities
Announcement date:	2021-05-18

Step 1: In the case of RWE, SLL-specific KPI information is obtained from the borrower's press release (RWE AG, 2021):

RWE has used the prolongation of its €5 billion syndicated credit line to link the longer-term €3 billion tranche to ESG criteria.

The conditions of this credit tranche are now linked to three criteria: the share of RWE's renewables portfolio in the generation fleet, the reduction of the CO<sub>2</sub> footprint of RWE's assets and the share of sustainable investments in the total investments according to the taxonomy criteria of the EU Commission. The latter is at the core of the EU action plan "Financing Sustainable Growth", with which the EU wants to create a binding classification system for environmentally sustainable economic activities and direct capital into green activities and financial products.

Image taken from RWE AG press release, 2021-05-18

<u>Step 2:</u> Searching for RWE in the SASB materiality finder, material industry topics for utility companies are obtained. The three KPIs reported in RWE's press release are now evaluated against the material industry topics. While the SASB materiality finder highlights 9 out of 26 relevant issues for RWE, my analysis finds that the three KPIs in the SLL are primarily related to two relevant issues: GHG emissions and business model resilience.

KPI 2 (the reduction of the CO2 footprint of RWE's assets) mainly addresses GHG emissions while KPI 3 (the share of taxonomy-eligible sustainable investments) mainly addresses business model resilience. According to the SASB, business model resilience *"includes responsiveness to the transition to a low-carbon and climate-constrained economy [...]. The category highlights industries in which evolving environmental and social realities may challenge companies to fundamentally adapt or may put their business models at risk"* (SASB, 2023). For KPI 1 (the share of RWE's renewables portfolio in the generation fleet) it can be argued that it supports both GHG emission reduction and business model resilience.

Relevant Issues (9 of 26)			(?) Why are some issues greyed out?	
Environment	Social Capital	Human Capital	Business Model & Innovation	Leadership & Governance
GHG Emissions ⑦ Air Quality ⑦ Energy Management Water & Wastewater Management ⑦ Waste & Hazardous Materials Management ⑦ Ecological Impacts	Human Rights & Community Relations Customer Privacy Data Security Access & Affordability (?) Product Quality & Safety Customer Welfare Selling Practices & Product Labeling	Labor Practices Employee Health & Safety ⑦ Employee Engagement, Diversity & Inclusion	Product Design & Lifecycle Management Business Model Resilience ⑦ Supply Chain Management Materials Sourcing & Efficiency Physical Impacts of Climate Change	Business Ethics Competitive Behavior Management of the Legal & Regulatory Environment Critical Incident Risk Management ⑦ Systemic Risk Management ⑦

Image of relevant issues for RWE AG according to the SASB materiality finder, taken from SASB.org

As all three KPIs are relevant according to SASB standards, the SLL scores full points in the second dimension.

## **Dimension 3 – Measurability**

Borrower:	FLSmidth & CO A/S (CPSE:FLS)
Country:	Denmark
Industry:	Basic Materials
Announcement date:	2022-10-13

KPI information is obtained from a press release of the lender (Nordic Investment Bank (NIB), 2022). All three KPIs are quantifiable, thus the SLL scores full points in the third dimension.

NIB and FLSmidth have agreed to include three key performance indicators (KPIs) to the investment loan. The KPIs address CO<sub>2</sub> emissions of FLSmidth's own operations and supply chain.

FLSmidth will:

- Be carbon neutral in its own operations by 2030
- Direct 30% of its spend to suppliers with similar decarbonisation targets
- reduce downstream scope 3 GHG emissions 56% per revenue from use of sold products.

Image taken from NIB press release, 2022-10-13

## **Dimension 4 – Benchmarking ability**

Borrower:	Maersk A/S (CPSE:MAERSK B)
Country:	Denmark
Industry:	Marine Freight & Logistics
Announcement date:	2020-02-25

KPI information is obtained from the borrower's press release (Maersk A/S, 2020). The press release states that the SLL KPI is benchmarked against a relevant industry metric, as given by the IMO target for CO2 reduction.

The credit margin under the facility will be adjusted based on Maersk's progress to meet its target of reducing CO2 emissions per cargo moved by 60% by 2030, which is significantly more ambitious than the IMO target of 40% by 2030 (all 2008 baseline).

Borrower:	Citycon Oyj (HLSE:CTY1S)
Country:	Finland
Industry:	Real Estate
Announcement date:	2020-11-17

Another example of a fully benchmarkable KPI selection is an SLL of the Finnish Real Estate company Citycon Oyj (Citycon Oyj, 2023). KPI 2 (the percentage of the property portfolio certified by BREEAM or LEED), and KPI 3 (energy consumption per square meter) are both based on relevant industry metrics that allow for a comparison with industry peers. For KPI 1 (the decrease in GHG intensity) no benchmark is mentioned in the press release, but I could confirm through further research that the GHG reduction objective refers to Science Based Targets set by the company. This information was obtained by scanning additional sustainability information available on the borrower's website: *"In 2019 we pledged to set Science Based Targets (SBTs) to guide us in the concrete steps to take in order to become carbon neutral by 2030. In September 2021, the targets were approved. "(Citycon Oyj, 2023).* 

The company has further increased the link between financing and its sustainability targets by signing a Sustainability-linked Revolving Credit Facility. In November 2020 Citycon refinanced its EUR 500 million Sustainability-linked Revolving Credit Facility, linking the margin on the credit facility to achieving three of Citycon's main environmental targets

- Decreasing the Greenhouse Gas Intensity of the portfolio in line with the target of being carbon neutral by 2030
- Decreasing energy consumption per square meter in line with achieving a 10% reduction by 2025 and
- Certifying the whole property portfolio according to LEED or BREEAM by year-end 2022.

Image taken from Citycon's corporate website

Dimension	5 –	Pricing	mechanism
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Borrower:	DIC Asset (XTRA:DIC)
Country:	Germany
Industry:	Real Estate
Announcement date:	2021-04-21

DIC Assets' sustainability linked Schuldschein contains both a bonus and a malus system, leading to a perfect score in the fifth dimension. Under the terms of the loan, the interest margin can change by 5bps in either direction or stay unchanged depending on the performance of the borrower. Crucially, maintaining the current share of green buildings in the portfolio leads to a penalty, i.e., the terms clearly incentivize improvements of the borrower in this metric (DIC, 2021).

Due to the ESG link of the Schuldschein, the interest rate on the various tranches can change by 5 basis points. Decisive here is the green building share in the existing property portfolio (Commercial Portfolio). That share equals 11.6% as of 31 December 2020. It will be periodically reviewed in the years ahead: If the share rises to 20% or more at the end of 2023, the interest rate for subsequent tranches will decline by 5 basis points. The rate will remain unchanged if the share is between 15% and 20%. If it remains below 15%, the interest rate will step up by 5 basis points. Subsequent reviews will take place in the years 2026 and 2029.

Image taken from DIC Asset AG's press release, 2021-04-21

Dimension	6 -	External	review
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Borrower:	Tele2 AB (OM:TEL2 B)
Country:	Sweden
Industry:	Technology
Announcement date:	2022-12-19

While the press release constituting the announcement of Tele2's first sustainability-linked revolving credit facility in December 2022 did not specifically mention an external review of performance against KPIs, Tele2 previously published a combined green and sustainability-linked financing framework covering external reviews. The framework was published in May 2022 and specifically states that "*in alignment with the Sustainability-Linked Bond Principles and the Sustainability-Linked Loan Principles, Tele2 will ensure an external and independent verification by one or more qualified external reviewers, [...], of its actual KPI performance levels against the targets (including the relevant SPTs). "Furthermore, "the verification shall be made public together with Tele2's annual SLF Progress Report on the company's webpage no later than the Reporting End Date, [...]" (Tele2 AB, 2000).*