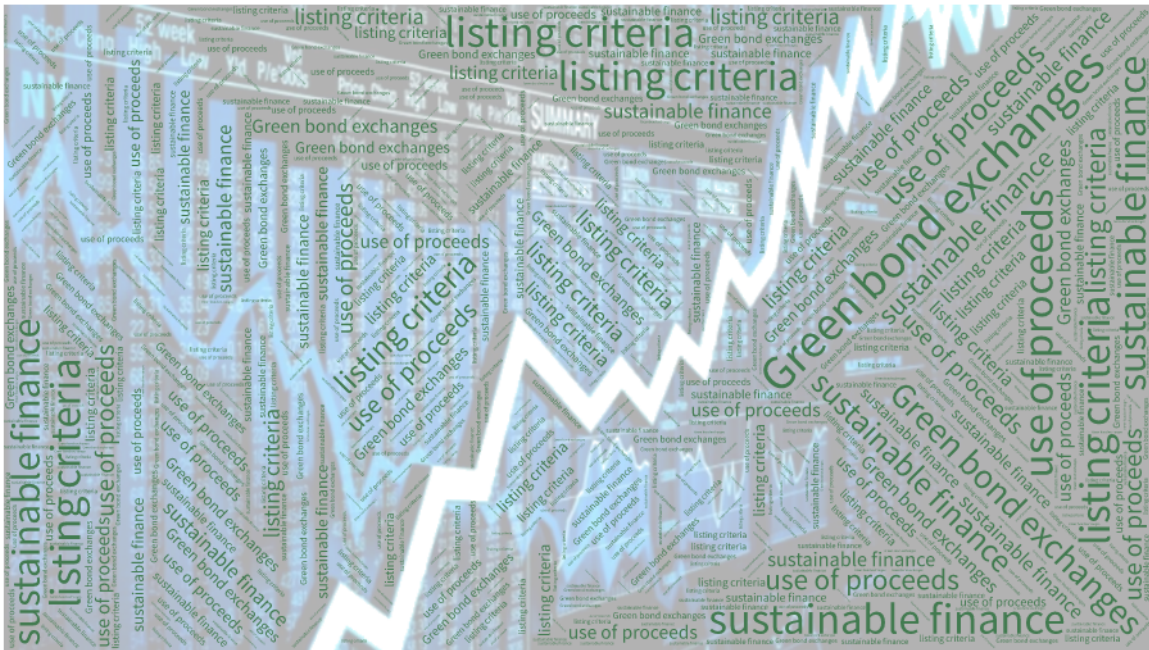


# Exchange-Traded Green Bonds

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## Abstract

The goal of this paper is to take stock of achievements made by five green bond exchanges in Europe (Borsa Italiana – Milano, London Stock Exchange, Luxembourg Stock Exchange, Nasdaq Stockholm, Oslo Børs). Green bond listings are an integral part of the Sustainable Stock Exchanges (SSE) Initiative, and the European Commission's Sustainable Finance Action Plan has recently acknowledged their key role. This paper introduces the role of exchanges in green finance, reports on the EU's sustainable finance strategy development, investigates the "green listing requirements" and provides statistical insights into listed green bond markets (number and value of traded bonds, average issue value, maturity of bonds, redemption structure and trading volumes, currency structure, etc.). To aggregate and concentrate the information of our statistical analysis and measure green performance, we prepared simple rankings of green exchanges on the basis of the indicators used in the analysis.

***[DISCLAIMER]:** the content of this draft analysis does not reflect the official opinion of the European Commission (It has been neither discussed, nor approved). Responsibility for the information and views expressed lies entirely with the author.*

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## Summary<sup>1</sup>

**The goal of this study is to take stock of achievements made by five green bond exchanges in Europe** (Borsa Italiana – Milano, London Stock Exchange, Luxembourg Stock Exchange, Nasdaq Stockholm, Oslo Børs).

**Green bond listings were integral part of the Sustainable Stock Exchanges (SSE) Initiative announced in New York in 2009.** Green listings led green finance market development by example (green listings, growing the green dialogue, development of green standards, providing guidance to investors).

**The European Union is strongly supporting the transition to a low-carbon, more resource-efficient and sustainable economy, and the development of markets for sustainable finance.** The European Commission announced the establishment of the High-Level Expert Group on Sustainable Finance (HLEG) to advice on developing a comprehensive EU strategy on sustainable finance in its communication on Capital Markets Union September 2016.

**The key role of exchanges has been acknowledged in HLEG's Interim and Final Reports and became part of the group's recommendations:** *'Stock exchanges and financial centres have a key role to play in promoting the growth of sustainable finance and the disclosure of material information related to sustainability. They can also support the integrity and growth of the green bond market by encouraging the development and application of robust standards.'*

**Several actions of the EC (2018) sustainable finance plan could support the future development of green bond exchanges** (development of an EU classification for sustainable activities, development of green standard and labels, enhancing non-financial, clarifying institutional investor duties, information disclosure).

**There are five pioneer exchanges, which are analysed in this study**

- Oslo Børs, (Green Bond listing since January 2015);
- Stockholm Stock Exchange (Sustainable Bonds list since June 2015);
- London Stock Exchange (Green Bond listing since July 2015);
- Luxembourg Stock Exchange (Green Bond listing since September 2016);
- Borsa Italiana (Green Bond listing since March 2017).

**Green bond listings are restricted to issuers, which meet the “green listing requirements” on the top of the standard listing requirements.** If an issuer fails to meet any of the requirements, it is being delisted from the green bond lists. The green listing criteria are based on principles and methodology set by industry guidelines, such as the Green Bond Principles (GBPs) and includes:

**(1) Use of proceeds** (climate change mitigation and adaptation, enhancing or protecting biodiversity, reducing resource use without negative impact on the environment, etc.),

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**(2) External review:** an independent assessment of the “green” and sustainability nature of the bond,

**(3) Transparency and disclosure:** issuers need to publish their external reviews and report regularly after the issuance date on details regarding the activities/projects at a reasonable frequency (usually at least once in every 12 months).

**This report summarizes descriptive statistics of green bond listings.** The sources of the data and information are the websites of stock exchanges, and the Climate Bonds Initiative (CBI) and [www.greenbond.org](http://www.greenbond.org) database as of August–September 2017.

### **Statistical indicators**

- Number of green bonds
- Value of green bonds (accumulated, mUSD)
- Number of issuers
- Average issued value (mUSD)
- Maturity (in years, at the time of the issuance)
- Redemption structure
- Turnover (mUSD)
- Currency distribution of green bonds (in %)
- Number of issuance currencies

**About one third of the 747 green bonds in our dataset, have been admitted to trading on European green exchanges before September 2017.** The Luxembourg Stock Exchange admitted the most green bonds (116) as one of the most important spots of the European and international capital markets.

**Accumulated face value of green bonds reached USD 166 billion, about half of which has been listed on European green exchanges.** It shows that the majority of green bonds of larger issuers are listed papers and that green exchanges are important marketplaces for the green bond asset class.

**Our analysis have identified 267 green bond issuers, and papers of about 80 have been admitted to trading on exchanges.** The majority of issuers, in total 183 remained unlisted, many of which issued bonds of smaller issuance value.

**Issuance value of individual bonds shows great variance amongst exchanges.** The Luxembourg Stock Exchange attracted supranational and larger issuers with an average issuance value of USD 578 million. In comparison, average issuance value of non-listed green bonds was only USD 73 million confirming that only the larger issuers can afford being listed.

**The maturity of listed green bonds is on average similar to the maturity of non-listed green bonds.** Green bonds listed on the Luxembourg Stock Exchange have on average the longest maturity of about 8–9 years, while for issuers on exchanges serving only their domestic market, green bonds have shorter maturities. This finding suggests, that large-scale companies are probably more able to act against the so-called ‘tragedy of the horizon,’ which is an important challenge in sustainable finance (HLEG, 2017b).

**Redemption volume is going to jump to USD 25–30 billion annually in 2019–20 from USD 5–8 billion in earlier years,** which will create a momentum for issuers and investors to (re)enter the market. More than 50 bonds will mature every year between 2017 and 2022. Therefore, **further development of the green taxonomy** and EU green bond

standards in accordance with the recommendations of the HLEG would help that this existing stock of green assets are renewed and better aligned with green goals in Europe and worldwide.

**A standard indicator to measure trading activity and market liquidity is the volume of trades.** Trading volume with green bonds was subdued recently—green bonds of USD 1.6bn value were exchanged in the period from Oct 2016 to Sept 2017. This implies that only a very small fraction, about 1 percent of the outstanding value, was traded. Such modest activity may be a consequence of the fixed income market structures in general (over-the-counter trading) and to investor behaviour (buy and hold strategy) especially.

**Euro plays a leading role as an issuance currency in European green exchanges, having 45 % of total issuance value, followed by the USD (31%) (Figure 10).** Nordic exchanges attract their domestic green bond issuers to fund in the domestic currency (NOK and SEK). Furthermore, SEK (11%) is important in offshore European green exchanges too, similarly to the GBP (6%). Although the weight of other currencies is small currently (similarly to other segments of international financial markets), the large number of issuance currencies (20 currencies<sup>2</sup> currently) could help to pave the way of future market developments in on-shore markets of Member States.

**To aggregate and concentrate the information of our statistical analysis, we prepared simple rankings on the basis of statistical indicators and SSE factsheets.** The Luxembourg Stock Exchange reached first rank amongst European green exchanges according to absolute rankings. It is perhaps not surprising that Nordic exchanges received lower ranks; however, one should remark that according to the turnover, which is a very important market development measure, they are in the lead. **Furthermore, if all financial exchanges were ranked, the Nordic exchanges would be in the top, as other exchanges, which are not covered by our analysis, have not yet launched green listings.**

**To broaden the scope of the analysis and understand future prospects better, a survey has been prepared and sent to green exchanges.** Experts in green exchanges expect further market growth for 2018–2019, challenged by the difficulties of setting up standards for companies in new industries, and by ensuring the quality of reporting. Although development and maintenance of green bond listings obviously entail implicit costs, exchanges provide green bond issuers access without any additional listing fees compared to vanilla bonds. Nasdaq Stockholm expects that the number of bonds on Nasdaq Stockholm will increase by approximately 50% during 2018. Oslo Børs envisage continuing its current work on market education and facilitating investor–issuer dialogue in order to grow the number of green bond listings in the market. LSE anticipate growth in the asset class to increase in 2018 as green financing continues to become more mainstream.

**This report is structured as follows.** Section 1 introduces the role of exchanges in green finance. Section 2 reports on the EU’s sustainable finance strategy development. Section 3 summarizes the ‘green listing requirements’. Section 4 provides statistical insights into green bond markets (number and value of traded bonds, average issue value, maturity of bonds, redemption structure and trading volumes, currency structure). Section 5 presents a survey sent to European green exchanges and results of the survey on green listing fees, market development, and challenges.

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<sup>2</sup> Issuance currencies of listed green bonds: AUD, BRL, CAD, CNY, COP, EUR, GBP, INR, JPY, MXN, MYR, NOK, NZD, PEN, PLN, RUB, SEK, TRY, USD, ZAR

## Role of exchanges in green finance

**Exchanges have been playing a fundamental role in the development and stimulation of green bond markets.** Exchanges have created a transparent green marketplace and served both issuer and investor sides of the market. This development has always been driven by both market and public forces since the first issuance of green bonds in 2007 by the European Investment Bank (EIB).

**Exchanges have been offering and improving market access for issuers and transparency for investors.** Issuers of green bonds can benefit from the wider investor base, increased visibility of the company and improved asset valuation feedbacks. On the other side, investors can improve their understanding of the company, and make better investment decisions on the basis of the disclosed information. Also, transactions may become easier and less costly in the medium run for larger issuers.

**Five pioneer exchanges are analysed in this study (ordered historically)**

- Oslo Børs, (Green Bond listing since January 2015);
- Stockholm Stock Exchange (Sustainable Bonds list since June 2015);
- London Stock Exchange (Green Bond listing since July 2015);
- Luxembourg Stock Exchange (Green Bond listing since September 2016);
- Borsa Italiana (Green Bond listing since March 2017).

**In January 2015, Oslo Børs became the first financial exchange in the world with a separate list for green bonds<sup>3</sup>.** The list was established in order to increase the visibility of green investment choices. Investors of green bonds could rely on second opinions and external reviews (see section on listing criteria), which verify the green nature of their security.

**Services provided by green bond exchanges:**

- Creation of marketplace
- Transparency and disclosure (financial and “green” information and data)
- Growing green dialogue
- Guidance on methodology (trainings and written guidance)
- Development of best practices
- Facilitating market liquidity
- signaling, leading by example (green benchmarks and indices)

**Table 1:** Benefits of being listed on green exchanges

Benefits for issuers	Benefits for investors
<ul style="list-style-type: none"><li>• <i><u>Better financing conditions</u></i>: wider investor base due to visibility, in some cases lower financing costs,</li><li>• <i><u>Visibility and brand building</u></i>: better recognition of the brand and improved consumer confidence</li></ul>	<ul style="list-style-type: none"><li>• <i><u>improved liquidity</u></i> of investments</li><li>• <i><u>transparency, disclosure</u></i> of green information about each security of investment</li></ul>
<ul style="list-style-type: none"><li>• <i><u>Market feedback</u></i>: market prices, volumes, issuer–investor relations provide valuable real-time information on how the company, it’s business strategy and assets are evaluated by the market</li></ul>	

<sup>3</sup> [https://www.oslobors.no/ob\\_eng/Oslo-Boers/About-Oslo-Boers/News-from-Oslo-Boers/Increasing-the-visibility-of-green-investment-choices-today](https://www.oslobors.no/ob_eng/Oslo-Boers/About-Oslo-Boers/News-from-Oslo-Boers/Increasing-the-visibility-of-green-investment-choices-today)



**Establishment of green bond listings was integral part of the Sustainable Stock Exchanges (SSE) Initiative announced in New York in 2009.** The initiative has been a voluntary learning platform for encouraging sustainable investment organized by the UN involving partner exchanges. SSE exchanges are required: (i) to sign the SSE Commitment Letter, (ii) to prepare SSE communication to stakeholders, (iii) to require ESG (Environmental, Social and Governance) reporting as a listing rule, (iv) to offer written guidance on ESG reporting and trainings on ESG, (v) to provide sustainability-related indices, (vi) to establish green bond listings.

**The commitments asked of exchanges by SSE are, however, not legally binding.** According to the SSE factsheet all exchanges in our sample comply with the first and last requirement (commitment letter signed and green bond listings started). The Luxembourg Stock Exchange also introduced ESG reporting as a listing rule in September 2017.

**Table 2:** Factsheet of the European Sustainable Stock Exchanges having green bond lists

	Borsa Italiana	London Stock Exchange	Oslo Børs	Stockholm	Luxembourg Stock Exchange
LAUNCH OF THE GREEN BOND SEGMENT	Mar-17	Jul-15	Jan-15	Jun-15	Sep-16
Sustainable Stock Exchange commitment signed?	☑	☑	☑	☑	☑
Sustainable Stock Exchange Communication prepared to stakeholders?	☑	☑	☒	☒	☒
ESG reporting as a listing rule required	☒	☒	☒	☒	☑
ESG reporting guidance offered	☑	☑	☑	☑	☒
ESG training offered	☑	☑	☑	☑	☒
Sustainability related indices offered	☒	☑	☒	☑	☑
Green bond listings	☑	☑	☑	☑	☑

**Source:** SSE Factsheets, Exchanges

**Although bonds traditionally have not been actively traded on exchanges, phasing in regulation may improve the situation.** Novick et al. (2014) argued that fixed income markets have been structured as over-the-counter (OTC) “principal” markets where dealers acquire the bonds and are compensated for market-making activity through the bid–offer spread, or the difference between purchase and sale price. The majority of bond holders acquire bonds in the primary market or via dealers. These investors can also be categorised as long-term investors or their institutional representatives (pension funds, insurance companies, etc.). Therefore, passive, buy-and-hold strategy has been dominant in the past, and investors have been holding their bonds often until the maturity after the acquisition (held to maturity, HTM). **The demand for credible secondary market platform trading for bonds is expected to increase after regulatory measures, such as the MiFID II, which is being applied from 3 January 2018.**

**There is an obvious trade-off from the HTM investor dominance: on the one hand HTM investors provide a guarantee of market stability, but on the other hand the bond market is less active and liquidity is shallower** (fewer trades, wider bid–ask spreads). Over-the-counter (OTC) markets have been preferred in the past by market participants because bond markets are usually more fragmented than stock markets, and exchange listing has been considered more expensive for smaller issuers. Technological advances and decreased trading costs may, however, improve the situation in regulated green bond markets.

**This study investigates green and sustainable bonds, which are debt obligations used to finance projects and activities that benefit the environment.** The category of ‘sustainable bonds’ is broader than ‘green bonds’ including social bonds (green AND social). Social bonds are used to finance projects targeting and achieving positive socio-economic



outcomes, with neutral or positive impact on the environment, while sustainable bonds are to finance projects that bring clear environmental and social-economic benefits. Most green exchanges also list social bonds, which are not discussed in our analysis in detail. The vast majority of bonds listed on Nasdaq Stockholm are labeled green (and no bonds are labelled social). The Luxembourg Stock Exchange lists mainly green bonds. About two third of the Borsa Italiana's list is green and remaining bonds are sustainable bonds. Only green bonds are listed in Oslo and London.

## The EU's sustainable finance strategy and exchanges

**The European Union is strongly supporting the transition to a low-carbon, more resource-efficient and sustainable economy.** The European Commission announced that it established a **High-Level Expert Group on Sustainable Finance (HLEG)** to advice on developing a comprehensive EU strategy on sustainable finance in its communication on Capital Markets Union September 2016.

**The importance of green bonds could be underpinned by one of the HLEG's key recommendations on the "European standard and label for green bonds."** The role of exchanges also acknowledged in the Interim and Final Reports:

*Stock exchanges and financial centres have a key role to play in promoting the growth of sustainable finance and the disclosure of material information related to sustainability. They can also support the integrity and growth of the green bond market by encouraging the development and application of robust standards.*

The HLEG recommended in its final report to

- **encourage stock exchanges to publish guidance on ESG reporting to investors**, establish lists or segments dedicated to sustainable financial instruments, building on work carried out by the SSE Initiative, including the voluntary action plan on 'How Stock Exchanges can Grow Green Finance'.
- **give consideration to streamlining and standardising ESG and sustainability information** that listed issuers are required to report, and encourage harmonisation of this information across stock exchanges, rather than simply adding to existing disclosure requirements.
- **encourage stock exchanges to establish alternatives to bank finance for small and medium-sized enterprises**, including privately held companies, by removing any regulatory barrier to the issuance of debt securities on regulated or exchange regulated markets at the member state level.

**Furthermore, HLEG's Interim and Final Reports mentioned indices and benchmarks as cornerstones in global capital markets.** Investors rely on them for measuring the market performance but also increasingly for capital allocation (passive investment strategies). Because the standard market benchmarks only reflect ESG issues and risks to the extent that the listed equity market (on average) more generally does, investment strategies based on them would follow the status quo.

**The European Commission's (2018) Action Plan on Sustainable Finance was adopted by the in March 2018 and set 3 main objectives**

1. reorient capital flows towards sustainable investment, in order to achieve sustainable and inclusive growth
2. manage financial risks stemming from climate change, environmental degradation and social issues
3. foster transparency and long-termism in financial and economic activity

**Several actions of the EC (2018) sustainable finance plan could support the future development of green bond exchanges** (development of an EU classification for sustainable activities, development of green standard and labels, enhancing non-financial, clarifying institutional investor duties, information disclosure).



**Source:** EC (2018)

By Q2 2018, the Commission intends to (i) adopt delegated acts, within the framework of the Benchmark Regulation, on the transparency of the methodologies and features of benchmarks to allow users to better assess the quality of sustainability benchmarks; and (ii) put forward, subject to the outcome of its impact assessment, an initiative for harmonising benchmarks comprising low-carbon issuers, based on a sound methodology to calculate their carbon impact, to be put into operation once the climate taxonomy is in place. The Commission's technical expert group will, on the basis of consultation of all relevant stakeholders, publish a report on the design and methodology of the low-carbon benchmark by Q2 2019.

## “Green” listing and trading platform requirements

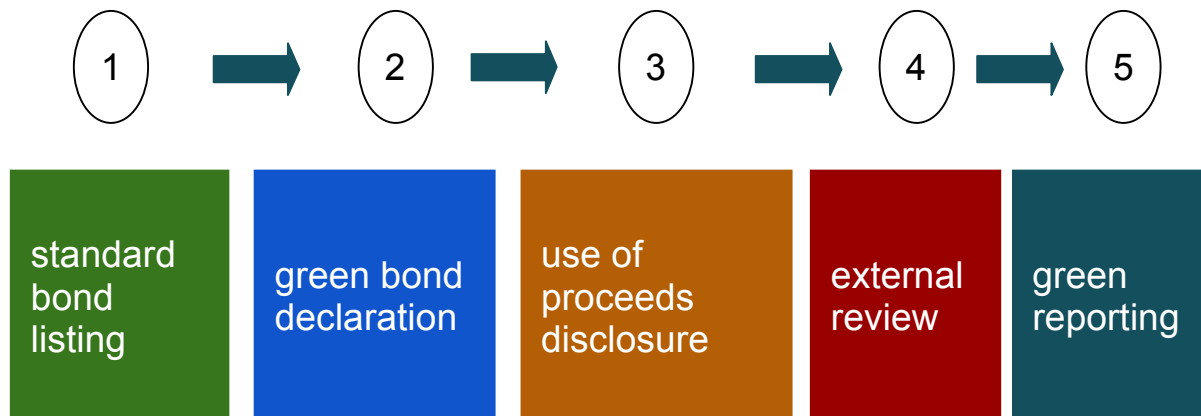
**Green bond listings and trading platforms are restricted to issuers that meet “green listing requirements” on the top of standard listing requirements.** In general, green bonds have the same standard listing requirements as “non-green” bonds (financial history, prospectus, reporting), but issuers have to meet further “green” listing requirements as well. These criteria are based on principles and methodology set by industry guidelines, such as the Green Bond Principles (GBPs).

## Green listing criteria

1. **Use of proceeds:** The proceeds raised must be used for projects that promote sustainability (climate change mitigation and adaptation, enhancing or protecting biodiversity, reducing resource use without negative impact on the environment, see the Luxembourg Stock Exchange's categorisation in the box below.)
2. **External review:** issuers shall submit external reviews/second opinions provided by independent parties. Such an assessment of the "green" and sustainability nature of the bond serves as a quality control and enables investors to make better-informed investment decisions.
3. **Transparency and disclosure**
  - a. **Publicity of external review:** external reviews have to be publicly available and attached when applying for listing. This is a stricter requirement than the current market guidelines such as the GBP, which only recommend (i) a second opinion or other approach, and (ii) the 'public disclosure of external reviews'.
  - b. **Reporting:** issuers need to provide details regarding the activities/ projects at a reasonable frequency (usually at least once in every 12 months) to confirm investors that the funds were used of the intended purposes.

**If an issuer fails to meet any of the green listing requirements, it is being delisted from the green bond list.** A paper can be delisted if it becomes non-compliant with the use of proceed criteria, or if it does not comply with its reporting and transparency requirements.

**Figure 1:** Green Bond listing procedure



**Source:** Borsa Italiana, Luxembourg Stock Exchange

**The bonds included in the Borsa Italiana's green and sustainable bond list are not listed in the traditional meaning of the word 'listed',** but available in its two markets for electronic trading of bonds, in the MOT and ExtraMOT. The former is a completely automated electronic trading system the latter is a Multilateral Trading Facility (MTF). Because the green listing requirements of bonds included in the Borsa Italiana's list are similar to those of other green exchanges, we present the information for these bonds. As the majority of these bonds are listed on other exchanges, in most cases on the Luxembourg Stock Exchange, we will refer to this fact in order to avoid showing a distorted picture stemming from double counting. Given that Borsa Italiana is a leading European retail market, it aims to provide securities available for trading for retail investors, to spread a culture of sustainable investment among private investors.

**Exchanges also specify criteria for external reviewers: they have to be independent from the issuer company.** The London Stock Exchange Group requires in particular that the organisation providing the external review must not be a subsidiary or owner, either in full or in part, of the entity issuing the bond. Furthermore, the organisation's directors, managers and advisors; remunerated according to methods that are such to prevent conflicts of interest deriving from the fee structure; and a specialized subject with expertise in assessing projects of an environmental and/or social nature with sufficient financial and market-specific expertise to perform a comprehensive assessment of the use of proceeds demonstrated for example by affiliation with relevant and widely recognized industry bodies; or significant and appropriate previous experience in providing second opinions on green bonds.

**Because development of standards needs cross-cutting knowledge, green bond exchanges rather implement standards than individually develop them.** Nasdaq Stockholm developed its green listing criteria together with Sustainalytics in 2015 and updated it two years later. Nasdaq's criteria do not aim to define what a green bond is. They merely stipulate the base requirements, such as use of proceeds, second opinion and reporting. The **Luxembourg Stock Exchange**, also clarified that the exchange **is not directly involved in defining whether a bond is "green,"** and nor does it endorse or recommend any specific taxonomy to assess the "greenness" of the use of proceeds.

Nonetheless the Luxembourg Stock Exchange **also highlighted that exchanges do have a role in encouraging transparency, and it has been advising issuers on what green bond reporting should include** to align with the market's best practices, even though it is not the role of a stock exchange to do so. LuxSE has been engaging with issuers anyway, because there is no internationally accepted standardisation for reporting yet and LuxSE has the relevant in-house expertise. The **Borsa Italiana** also **does not intend to "specify what those environmental benefits, or impacts, might be,"** and leaves third-party certifiers the power over the definition of what a green bond is.

**Indeed, there is an important ongoing debate on the green taxonomy amongst experts and practitioners, which influences the development of green exchanges.** The European Commission (2017) commissioned a study on taxonomy, which confirmed that definitions of what is green are often developed individually and vary in regard to scope, level of detail, transparency and other dimensions. This diversity increases uncertainty and therefore the development of the taxonomy was one of the key early recommendations of the HLEG and part of the European Commission's Action Plan on Sustainable Finance. An important final recommendation of the HLEG was the work on the EU taxonomy—or a classification system—for sustainable finance. Hence, the development of the taxonomy became a key action of the EC (2018) sustainable finance plan in March 2018. The common understanding of sustainable finance is an important condition for market development, including green bond trading, to reach scale. Definition of EU standards and labels for Green Bonds would also allow addressing market fragmentation and accelerating green investments. Also, the HLEG recommendations of accreditation possibility could influence on who counts as an external reviewer, and how the taxonomy requirements are applied in practice. Informal supplementary information on the development of the green bond standards is provided in Annex 1 of the HLEG's Final Report (HLEG 2017b).

**Wilkinson (2018) also argued that although asset owners and managers are requesting stock exchanges to provide more information, for the moment, there is no general market practice in impact reporting.** Because issuers are using different methodologies, there is an uncertainty of how the reports and the underlying assets could be compared. Therefore some kind of standardisation is needed, especially simple KPIs (key performance indicators) could be useful for investors.

**The study of Corporate Knights (2017) tracks the extent to which the world's publicly traded companies are disclosing seven sustainability indicators.** Although, the focus in the study is on stock markets, it can help to look at a broader picture of capital market development and to grasp the relative performance of regulated markets in terms of sustainability.

**43% of large corporations around the world now report on their greenhouse gas emissions,** arguably the most important metric in relation to the monumental climate challenge. The essential driver of the progress has been regulations, illustrated by a clear common denominator shared by each of the top-10-ranked stock exchanges: 10 out of 10 are in jurisdictions where there are regulations mandating sustainability disclosure.

**The Nasdaq–Stockholm, London Stock Exchange, and Oslo Bors achieved 2nd, 4th, and 5th rankings (the Luxembourg Stock Exchange was not ranked).** The study shows that the focus of sustainability disclosure should be wider than looking at only climate related measures, it should include water, waste and social factors. The study found that of 6,441 large companies analysed, 48 disclosed information on **greenhouse gas followed by energy (40%), water (38%), waste (29%), injuries (24%) and employee turnover (15%).**

**Table 3:** Sustainable Disclosure Rankings

	Ranking (2017)	Disclosure score	Disclosure growth	Timeliness score	Overall Score
Luxembourg Stock Exchange	-	-	-	-	-
Borsa Italiana	21	61.9	32.5	38	<b>48.9</b>
London Stock Exchange	4	77.8	39.1	90.4	<b>73.9</b>
Nasdaq - Stockholm	2	78.4	42.5	97.6	<b>77.5</b>
Oslo Børs	5	70.8	48.8	95.2	<b>73.7</b>

**Source:** Corporate Knights (2017)

## Statistics of green bond exchanges

**This section summarizes descriptive statistics of green bond listings.** The sources of the data and information are the websites of stock exchanges, the Climate Bonds Initiative (CBI), and [www.greenbond.org](http://www.greenbond.org) database as of September 2017.

The latest version is available as an open Mendeley Dataset:

<http://dx.doi.org/10.17632/y49w92dzh3.1> - file-d20e8edd-8e6b-42b8-8494-bbf061ec106e

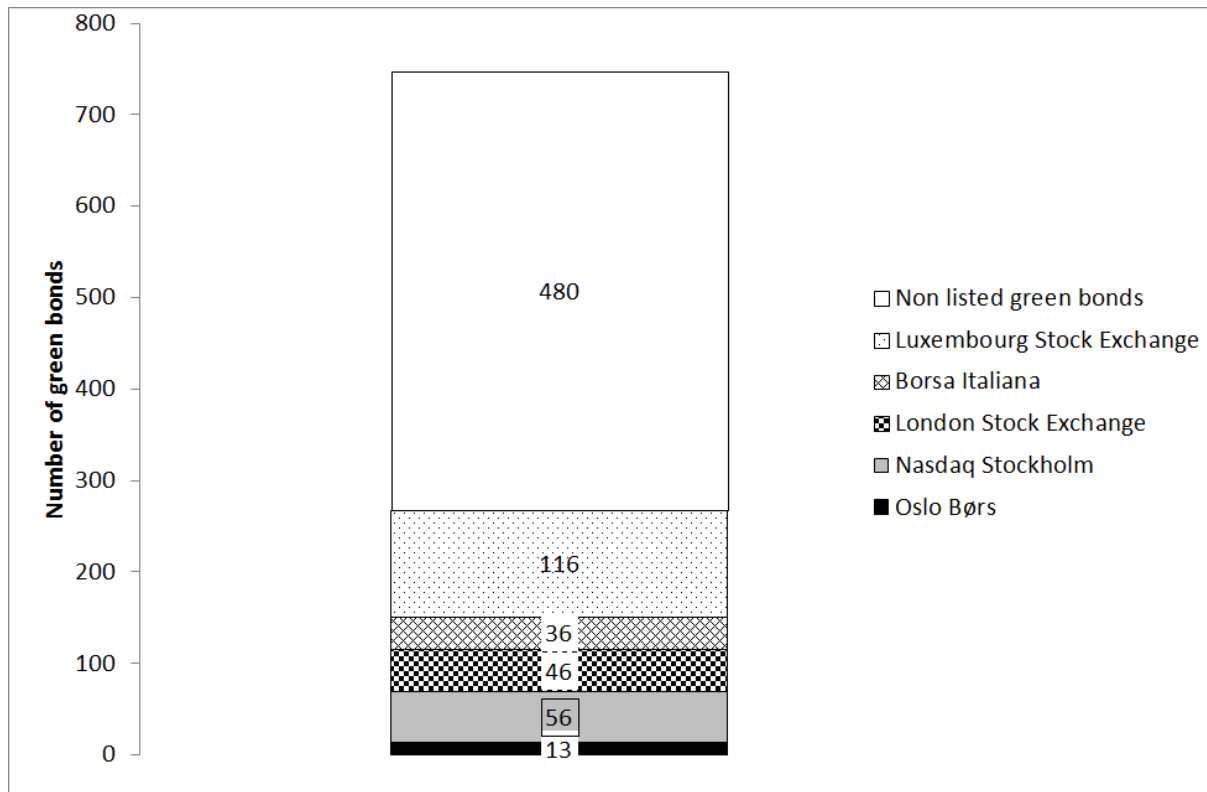
### Statistical indicators

- Number of green bonds
- Value of green bonds (accumulated, mUSD)
- Number of issuers
- Average issued value (mUSD)
- Maturity (in years, at the time of the issuance)
- Redemption structure (by calendar years from 2018)
- Turnover (mUSD)
- Currency distribution of green bonds (in %)
- Number of issuance currencies

## Number of listed green bonds

**About one third of the 747 green bonds have been admitted to trading on European green exchanges before September 2017.** The Luxembourg Stock Exchange admitted the highest number of green bonds (116)—one of the most important spots of the European and international capital markets. The number of green bonds is also high and has been increasing in the Borsa Italiana (trading), London Stock Exchange, and Nasdaq Stockholm. The share of listed bonds may be influenced in the future by the size of issuer companies. As large companies are more likely to be listed on exchanges, appearance of more non-listed issuers could mean that a decreasing share of papers is going to be listed.

**Figure 2:** Number of green bonds (listed and non-listed, in Q3 2017)\*

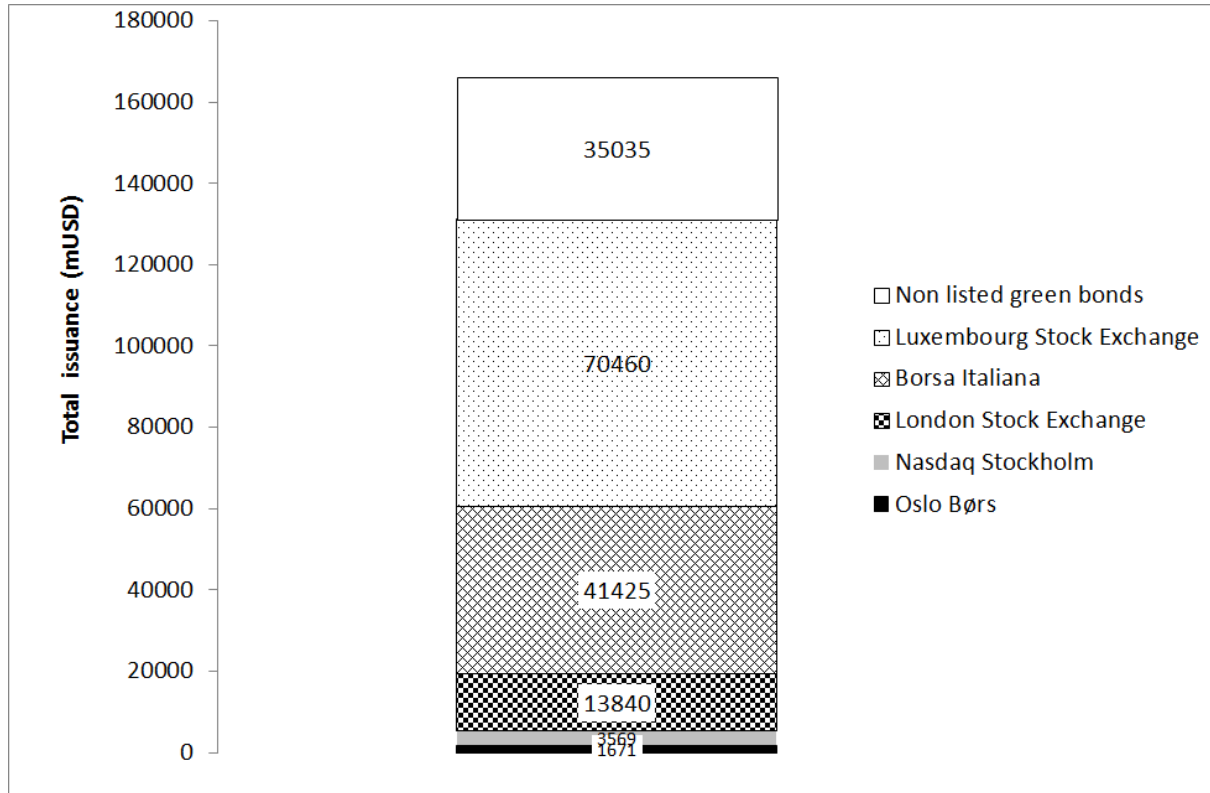


\* The bonds included in the Borsa Italiana's green and sustainable bond list are available for trading in its two markets for electronic trading of bonds, in the MOT and ExtraMOT. The majority of these bonds are listed on other exchanges, in most cases on the Luxembourg Stock Exchange.

## Value of listed green bonds

**Accumulated face value of green bonds reached USD 166 billion, about half of which has been listed on exchanges.** It shows that the majority of green bonds of larger issuers are listed papers. In particular, the Luxembourg Stock Exchange (USD70bn green bonds listed).

**Figure 3:** Value of green bonds issued (accumulated, Q3 2017)\*



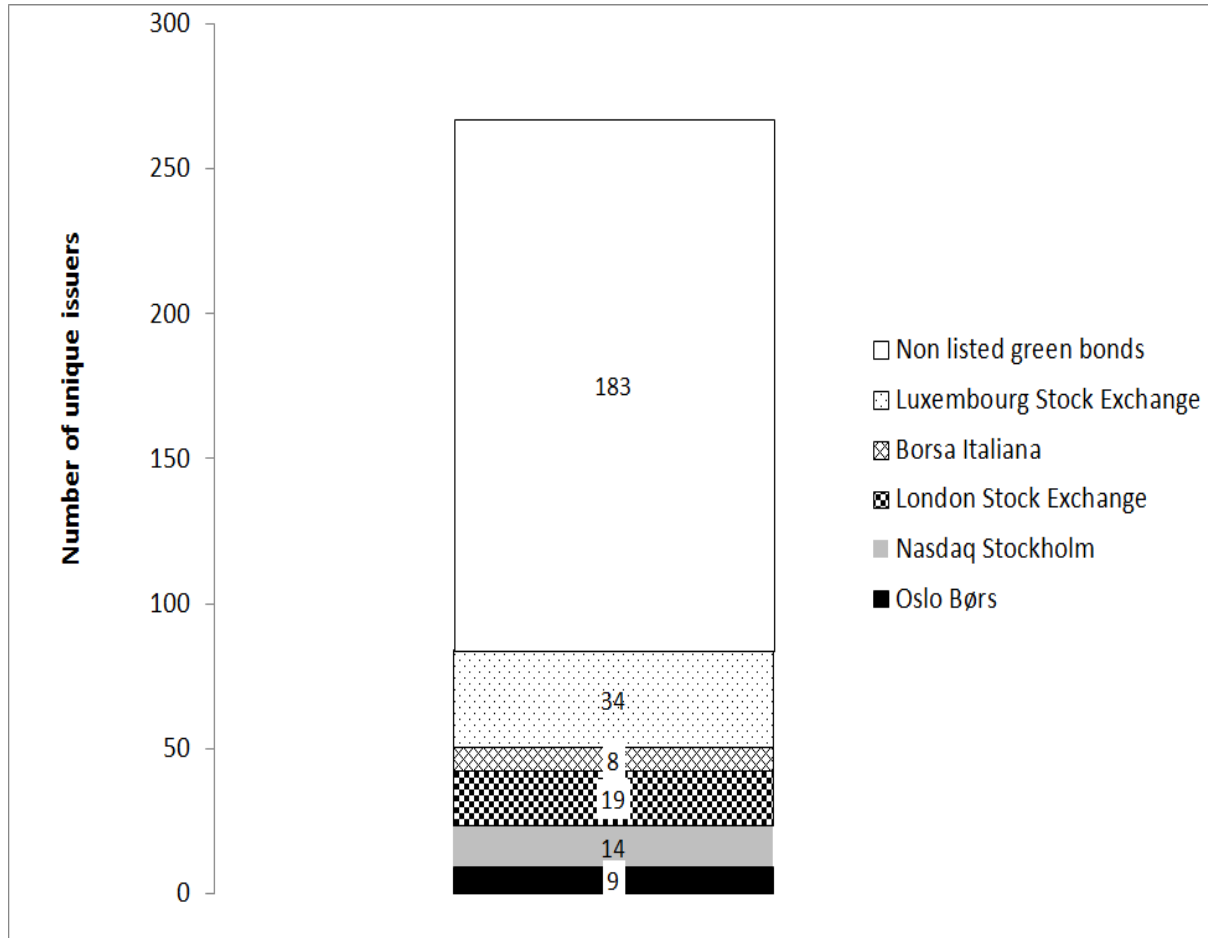
\* See the comment on the Borsa Italiana's green bonds under Figure 2.



## Number of issuers

**Our analysis has identified 267 green bond issuers, and papers of about 80 have been admitted to trading on exchanges.** The majority of issuers remained unlisted. There are 34 issuers admitted to the Luxembourg Stock Exchange's green bond listing, 19 issuers listed on the London Stock Exchange and 14 on the Nasdaq Stockholm.

**Figure 4:** Number of issuers\*

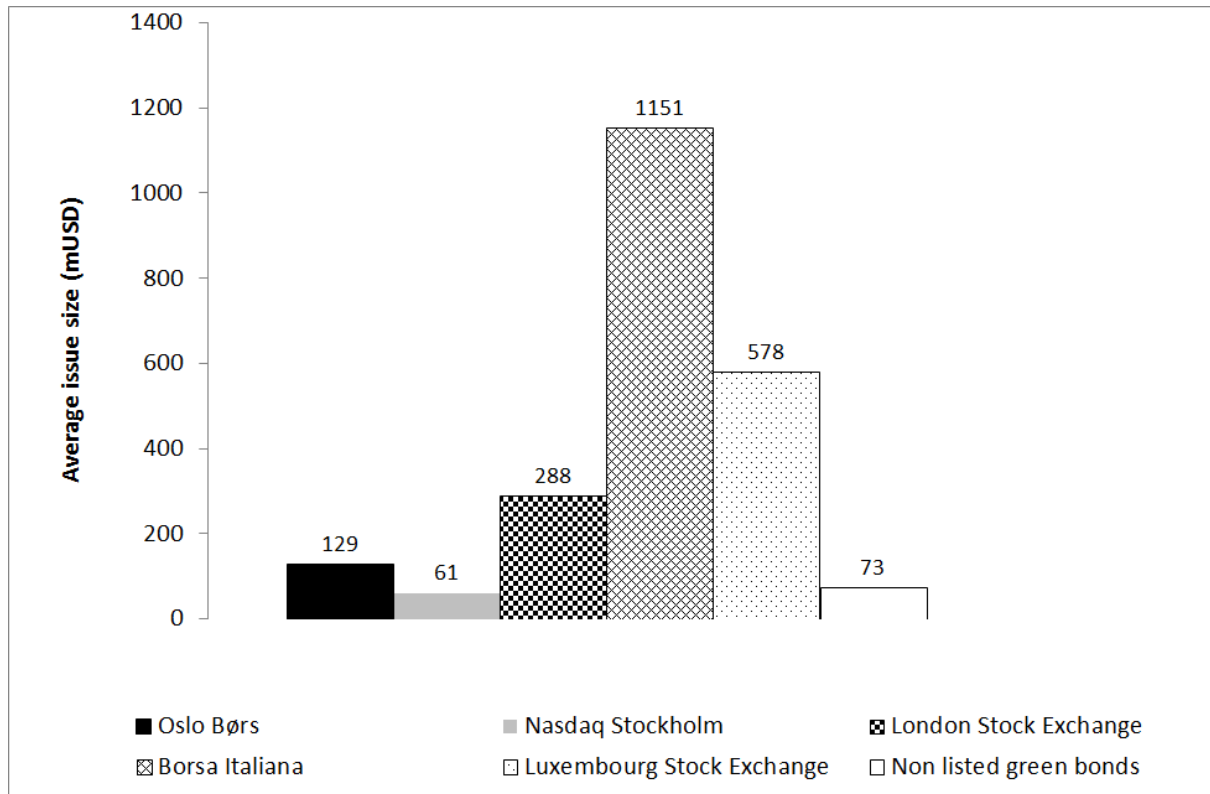


\* See the comment on the Borsa Italiana's green bonds under Figure 2.

## Average issue value

**Issue value of individual bonds shows great variance amongst exchanges.** The Luxembourg Stock Exchange attracted large issuers with an average issuance volume of USD 578 million. In comparison, value of non-listed green bonds was only USD 73 million confirming that only the larger issuers can afford being listed.

**Figure 5:** Average issue value (mUSD)\*



\* See the comment on the Borsa Italiana's green bonds under Figure 2.

## Maturity of green bonds

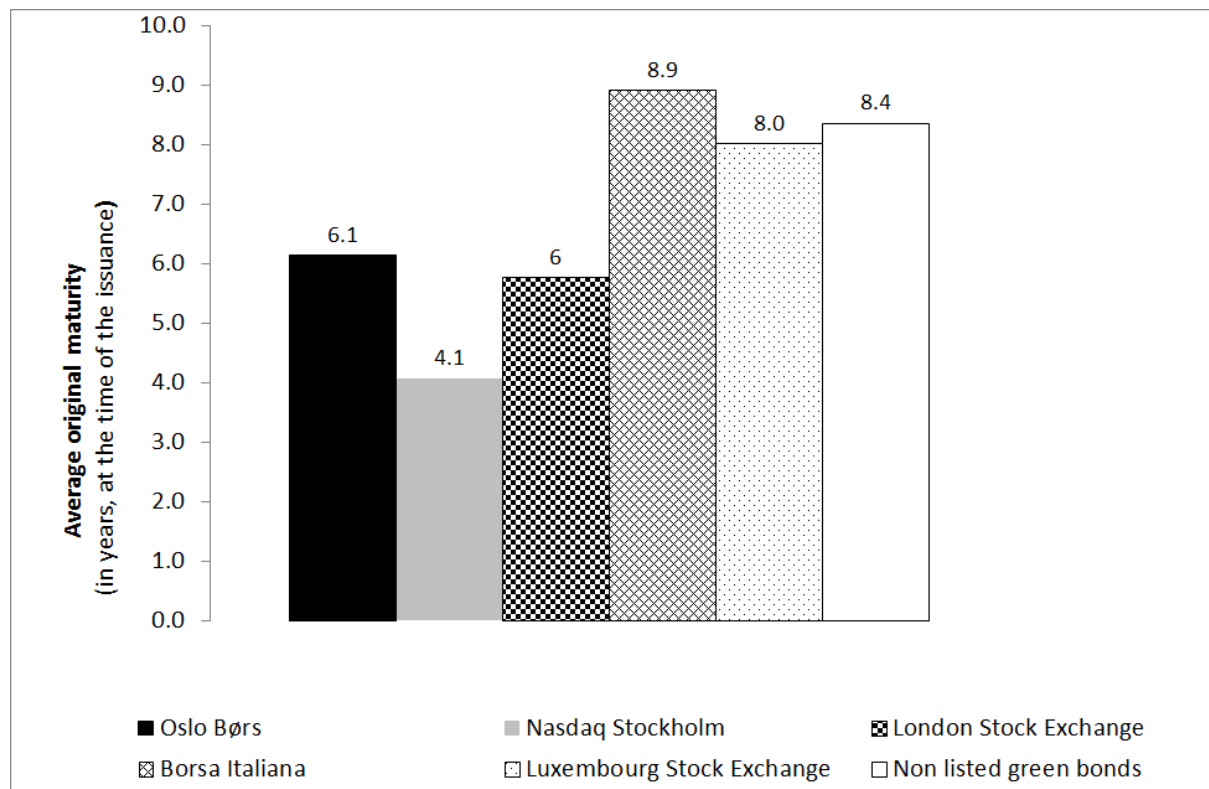
**Bond finance is a natural fit for low-carbon and climate-resilient infrastructure assets such as renewable energy infrastructure, which is characterised by high upfront capital costs** and long-dated and frequently inflation-linked income streams (OECD, 2017). Still, there is often a maturity mismatch between long-term projects, long-term risk materialisation, and their short-term market liabilities ('tragedy of the horizon') (HLEG, 2017).

**However, [DC Water](#) issued a USD350M green bond with 100-year maturity in 2014** (interest rate: 4.81%) with the following goals:

- Asset-Liability Matching: century bonds permit matching long-lived assets and liabilities on its balance sheet.
- Intergenerational Equity and Fairness: century bonds spread the costs of the project more affordably and fairly to those who will benefit over the next 100 years.
- Committed, Long-Term, Low-Cost Capital: century bonds allow DC Water to take advantage of historically low interest rates and to lock-in funding costs for a very long-lived asset.

**The average maturity of listed green bonds is similar to the maturity of non-listed green bonds.** Green bonds listed on Luxembourg Stock Exchange have on average the longest maturity of about 8–9 years, while issuers of papers with smaller issuance value on Nordic exchanges issue green bonds with somewhat shorter maturities. This finding suggests, that larger companies are probably more able to act against the so-called tragedy of the horizon, which is a key challenge in sustainable finance.

**Figure 6:** Average original maturity of listed and non-listed green bonds (at the time of the issuance)



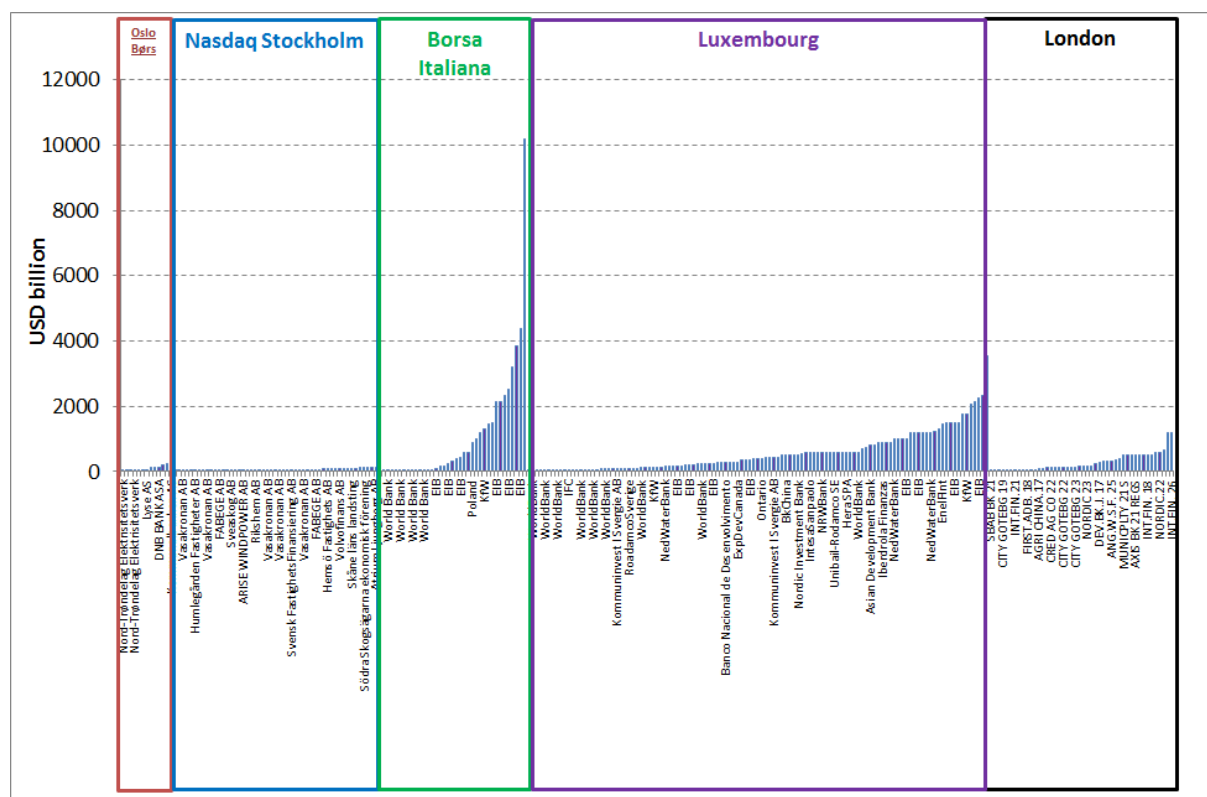
\* See the comment on the Borsa Italiana's green bonds under Figure 2.

## Key issues

**Supranational institutions (EIB, Wordbank) have been the pioneering issuers in the green bond market.** In 2007 the EIB issued the world's first Green Bond, and it had a 51% share in outstanding supra Green Bonds market (over USD100m) in 2016. The Luxembourg Stock Exchange listed the first-ever green bond to enter the market in 2007, the European Investment Bank's "Climate Awareness Bond."

**Supranational and sovereign issuers (e.g. France and Poland) are large enough to scale up the size of their green bond issuance.** Sovereign issuers and large-scale companies can easier meet the standard and green listing criteria of exchanges. Most investors select their papers as part of their portfolio because larger issuers have usually better credit rating, are more stable and the liquidity of the underlying paper is higher.

**Figure 7:** Issuers across green listings



\* See the comment on the Borsa Italiana's green bonds under Figure 2.

## Redemption structure

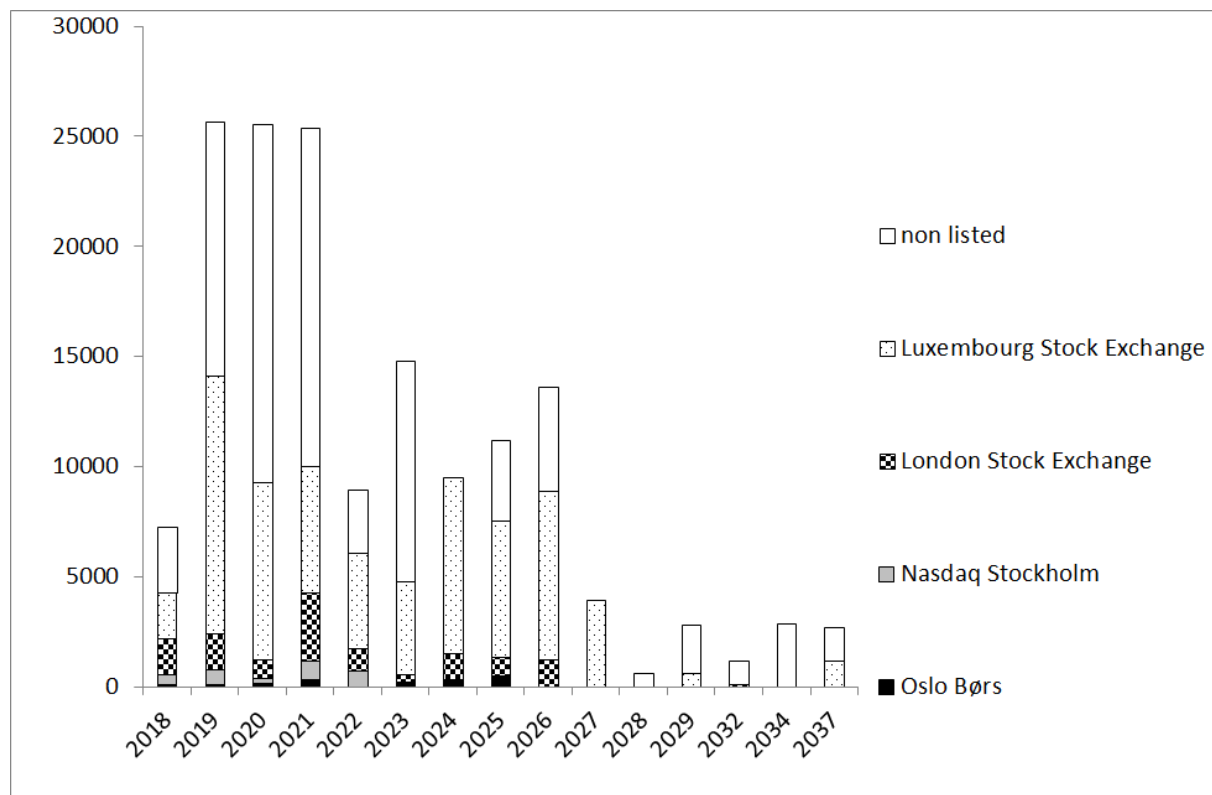
**In general, refinancing of debt is associated with the so-called rollover risk.**

Rollover risk increases, if the maturity structure of an issuer is too concentrated, and the issuer has to refinance a large share of its debt at a given point of time. Too high rollover risk is also to avoid, because it limits the bargaining power of the issuer and implies higher refinancing costs. The concentration of redemption in the entire market, however, provides an opportunity for (new) issuers to attract investors, as their money is becoming unlocked and in many cases reinvested and an opportunity for regulators to improve standards.

**Redemption volume is going to jump to USD25/year in 2019–20 from USD5 to 8bn in earlier years,** which will create a momentum for issuers and investors to (re)enter the market. More than 50 bonds will mature every year between 2017 and 2022.

**Furthermore, the development of the green taxonomy and EU green bond standard, in accordance with the recommendations of the HLEG and the European Commission’s action plan on sustainable finance, would help that this existing stock of green assets are renewed and better aligned with green goals.**

**Figure 8:** Redemption structure of green bonds (mUSD)



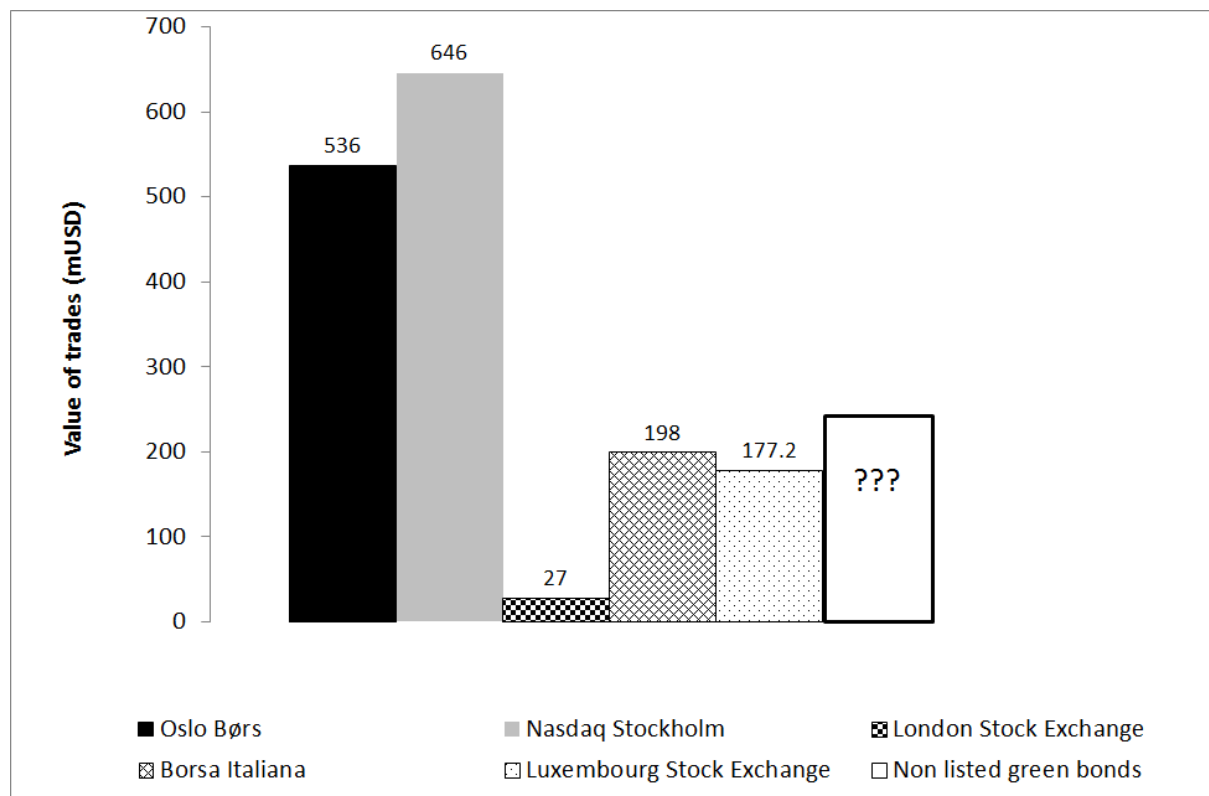
\* See the comment on the Borsa Italiana’s green bonds under Figure 2.

## Volume of trades

**A standard indicator to measure trading activity and market liquidity is the volume of trades.** Trading volume on green exchanges was subdued recently, only green bonds of USD 1.6bn value were exchanged in the period from Oct 2016 to Sept 2017. This implies that a very small fraction, about 1 percent of the outstanding value was traded. Such modest activity may be a consequence of the fixed income market structures in general to passive investors strategy (buy and hold strategy), and to the dominance of over-the-counter trading. Regarding the trade statistics, it is important to clarify that all trades on Nasdaq Stockholm sustainable bonds were made OTC. One can however only speculate on the OTC trade value of other green bonds listed on other exchanges.

Long time series information on trading volumes was not available for all investigated exchanges, but the data of Oslo Børs and Nasdaq Stockholm (the first two pioneering exchanges that established green listing) show that trade value increases as the market becomes more developed and the number of issuers and investors grows.

**Figure 9:** Volume of trades (mUSD, Oct 2016–Sept 2017)\*



\*All Nasdaq Stockholm trades were made OTC.

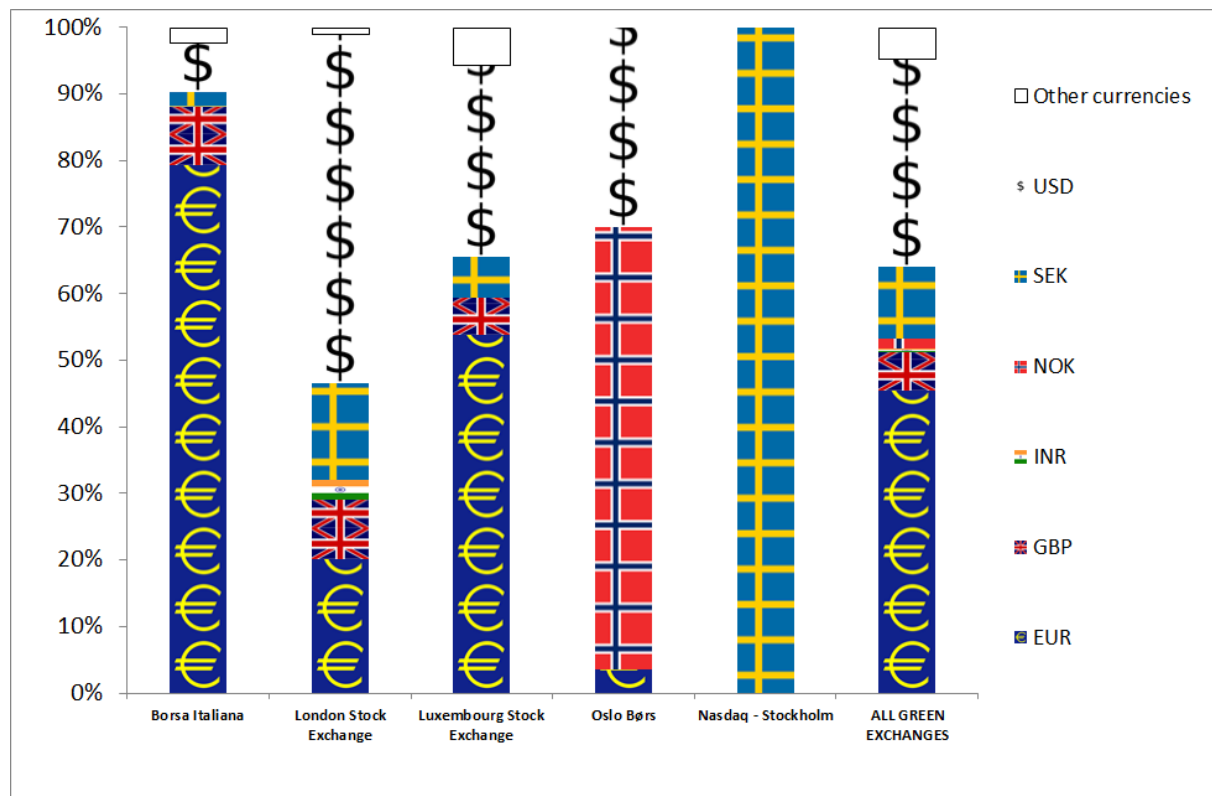
See the comment on the Borsa Italiana's green bonds under Figure 2.

## Currency distribution

**Euro plays a leading role as an issuance currency in European green exchanges, having 45 percent of total issuance value, followed by the USD (31%) (Figure 11).**

Nordic exchanges attract their domestic issuers to fund in the domestic currency (NOK and SEK) most of their activities through green bonds. Furthermore, SEK (11%) is important in offshore European green exchanges too, similarly to the GBP (6%). Although the weight of other currencies is small currently (similarly to other segments of international financial markets), the large number of issuance currencies (20 currencies<sup>4</sup> currently) could help to pave the way of future market developments domestically in many countries.

**Figure 10:** Currency distribution of green bonds (in %)

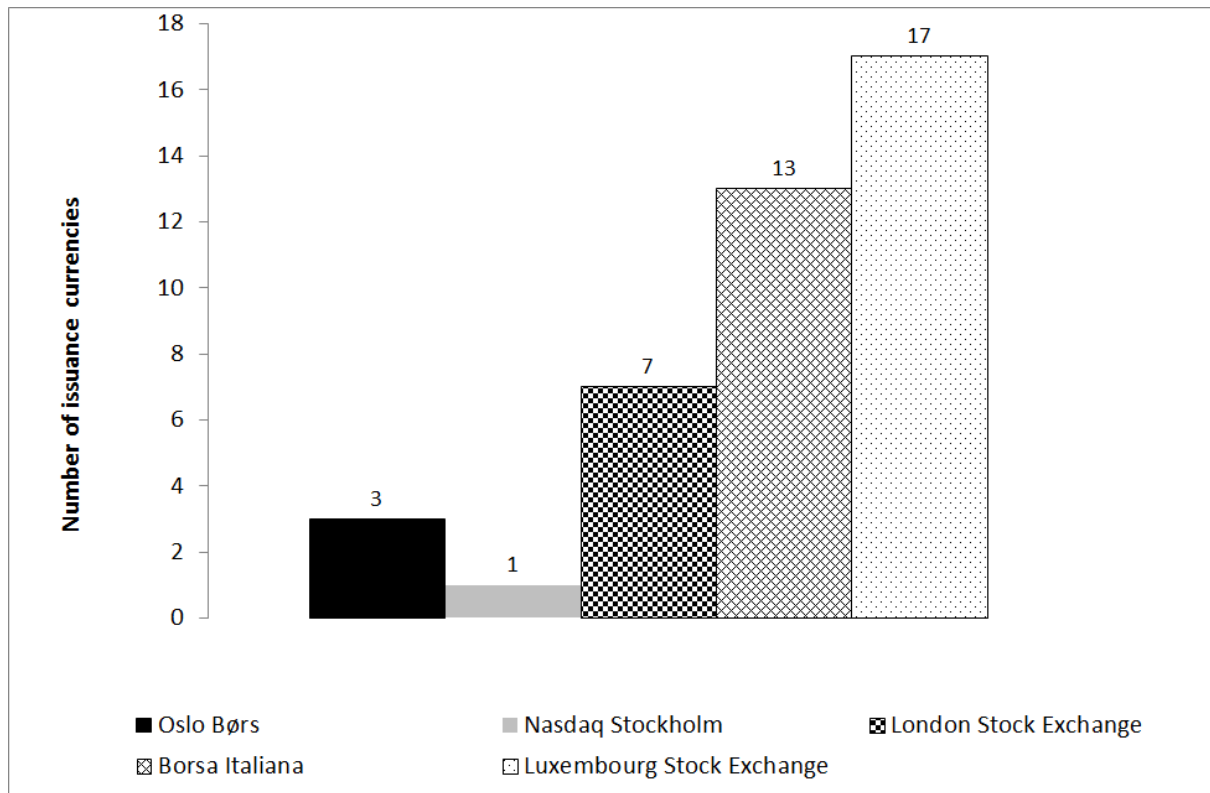


\* See the comment on the Borsa Italiana's green bonds under Figure 2.

<sup>4</sup> Issuance currencies of listed green bonds: AUD, BRL, CAD, CNY, COP, EUR, GBP, INR, JPY, MXN, MYR, NOK, NZD, PEN, PLN, RUB, SEK, TRY, USD, ZAR



**Figure 11:** Number of issuance currencies



\* See the comment on the Borsa Italiana's green bonds under Figure 2.

## Simple ranking of European green exchanges

**To aggregate and concentrate the information of the statistical analysis, rankings were prepared based on the indicators used in the analysis.** We used the values of five indicators to rank exchanges in terms of greenness (absolute ranking, left side of Table 4.). These indicators were: the number of green bonds, the accumulated value of listed green bonds, the number of issuers, and the number of issuance currencies. We did not rank exchanges according to the average value of issued bonds, tenor, currency distribution, and redemption structure, as these could not be interpreted in a meaningful way.

**To construct relative performance measures, we used the SSE Factsheet information (Table 2.), the Corporate Knights disclosure index (Table 3.)** and also compared the number of green bonds and the number of green bond issuers to the total number of bond issuers and total value of bonds listed in the exchanges.

**The Luxembourg Stock Exchange ranked first in case of four absolute indicators amongst European green exchanges, followed by Nasdaq Stockholm.** When comparing the sustainable and green bond market to the total market, Nasdaq Stockholm ranked first.

The LUXSE was awarded the green bond exchange of 2017, which confirms its leading role in sustainable finance.

**Table 4:** Ranking of green bond exchanges

	absolute ranking					relative ranking			
	Number of green bonds	Value of green bonds (accumulated, mUSD)	Number of issuers	Turnover (mUSD)	Number of currencies	Number of green bonds	Number of issuers	Corporate Knights relative	SSE ranking
Luxembourg Stock Exchange	1	1	1	4	1	5	5		4
Nasdaq - Stockholm	2	4	3	1	5	1	1	1	1
London Stock Exchange	3	3	2	5	3	4	4	2	1
Borsa Italiana	4	2	5	3	2	2	3	4	1
Oslo Børs	5	5	4	2	4	3	2	3	5

\* See the comment on the Borsa Italiana's green bonds under Figure 2.

Obviously, this way of information aggregation should not be considered as the most precise or best aggregation methodology, however it may help to understand the performance of green bond exchanges currently.

## Surveying plans and challenges of green exchanges

**To broaden the scope of the analysis and understand the future prospects better a survey has been prepared and sent to green exchanges in February 2018.** Experts in green bond exchanges expect further market growth for 2018–2019, challenged by the difficulties of setting up standards for companies in new industries, by ensuring the quality of reporting and that disclosure of the use of proceeds is exhaustive, material and in line with an international taxonomy. (Detailed answers of green bond exchanges to our questionnaire could be found in the ANNEX.)

### Green listing fees

Although development and maintenance of green bond listings obviously entail implicit costs, exchanges provide green bond issuers access **without any additional listing fees compared to vanilla bonds**. This means a preferential treatment and confirms the positive role and leading example, which green exchanges have in capital market development.

## Experience with green bond listings

**LuxSE was the pioneer in the listing of the very first green bond ever issued (2007 European Investment Bank Climate Awareness Bond).** It has extensive experience with green bonds. LuxSE helped shape the market from its early beginnings, today it has the highest number of green, social and sustainability bonds listed and admitted to trading. On top of that, more self-labelled green bonds are listed on the Luxembourg Stock Exchange without being displayed on the LGX platform.

**Over the years, LuxSE has also built a product specific expertise beyond regular green, social, and sustainability bonds.** It listed the first sovereign green bond (issued by the Republic of Poland) and has listed innovative products such as green covered bonds (e.g. Sparebank 1 Boligkreditt) and hybrid green bond (e.g. Ørsted and Iberdrola). Furthermore, LuxSE has developed an in-house expertise on green bond market standards, external reviews, post issuance reporting, and the approval of green bond prospectuses for the exchange-regulated Euro MTF market.

**In total, there are 64 green bonds listed in London that have raised over USD 20.67 billion in aggregate terms across seven currencies.** London Stock Exchange is also the listing venue of the first green bonds out of China, India, and the Middle East. Key wins in 2017 include National Bank of Abu Dhabi issued a \$587m green bond on LSE in March 2017 under its \$7.5bn MTN programme. The National Bank of Abu Dhabi's landmark transaction represents an important milestone for green finance being the first Green Bond deal from the Gulf region.

## Market development

**Nasdaq Stockholm expects that the number of bonds on Nasdaq Stockholm will increase by approximately 50% during 2018.**

**Oslo Børs envisage continuing its current work on market education and facilitating investor–issuer dialogue in order to grow the number of green bond listings in the market.**

**LSE is seeing significant growth in green bond issuance with 2017 representing a record year in terms of number of deals and volume raised.** In 2017, issuers raised \$10.1bn equivalent in green bonds, representing a 78% increase vs. 2016. In terms of number of issuances, compared to 14 green bonds which raised \$5.65 billion in 2016, 2017 saw 27 new green bonds admitted—a 93% increase. LSE anticipates growth in the asset class to increase in 2018 as green financing continues to become more mainstream.

## Challenges

**Nasdaq Stockholm mentioned the difficulties of setting up standards for companies in new industries.** The LuxSE confirmed the challenges of enforcing environmental accountability and reporting. For example, important questions are:

- How to assess the quality of reporting and determine minimum levels of information?
- How to ensure reporting quality, including impact reporting, which could be applicable across different issuer types and industry sectors?
- How to ensure comparability in a context of multiple metrics, KPIs and reporting styles?
- How to ensure that disclosure of the use of proceeds is exhaustive, material and in line with an international taxonomy.

Market development could be curbed by the lack of supply of viable projects to be brought to capital markets.

**Oslo Børs identified limited local investor interest as a result of few Norwegian investors having dedicated green investment mandates.** Another challenge is that potential issuers appear to have insufficient knowledge about the advantages of issuing green bonds.

**LSE sees one of the biggest challenges of green bond issuance is the perception of the difficulty of the process vs. issuing a vanilla bond.** London Stock Exchange spends a lot of time working with issuers to educate them around the process and what it involves in order to dispel this idea.

**Increasingly, another area of concern for green bond issuance is around transparency and the role of exchanges in promoting the ongoing green disclosure obligations and ongoing reporting.** LSE gets heavily involved in all initiatives to provide thought leadership around how to move towards standardisation of standards in the green space, and how to help promote transparency of green bonds over the lifetime of their issuance. One such example is the ESG Reporting Guidance the LSE published which gives issuers useful insight into what they should be disclosing in relation to their ESG endeavours for resonate most effectively with investors.

### **Green bond plans for 2018 and 2019**

LSE anticipates seeing the continuation of strong growth in the green space in 2018 and 2019. It predicts that more issuers will choose to issue debut bonds in green format in order to maximise their investor diversification and, equally, to see more international issuers tapping the market. LSE continues to work with international issuers and various stakeholders to boost this activity.

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## ANNEXES

### List of abbreviations and definitions

<b>CBI</b>	-	Climate Bonds Initiative
<b>EA</b>	-	Euro Area
<b>EC</b>	-	European Commission
<b>EIB</b>	-	European Investment Bank
<b>EMU</b>	-	Economic and Monetary Union
<b>ESG</b>	-	Environmental Social and Governance
<b>EU</b>	-	European Union
<b>HLEG</b>	-	High-Level Expert Group on Sustainable Finance
<b>HTM</b>	-	Held to maturity
<b>KPI</b>	-	Key Performance Indicators
<b>MTF</b>	-	Multilateral Trading Facility
<b>LSE</b>	-	London Stock Exchange
<b>LUXSE</b>	-	Luxembourg Stock Exchange
<b>OTC</b>	-	Over-the-counter
<b>SSE</b>	-	Sustainable Stock Exchanges

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## Details of green bonds (ISIN, issuer, value, date)

### Oslo Børs

ISIN	exchange	issuer	total issue (musd)	issue date
NO0010723265	Oslo Børs	Nord-Trøndelag Elektrisitetsverk	13	11/30/2014
NO0010723240	Oslo Børs	Nord-Trøndelag Elektrisitetsverk	32.5	11/30/2014
NO0010727662	Oslo Børs	Vardar AS	39	12/31/2014
NO0010723257	Oslo Børs	Nord-Trøndelag Elektrisitetsverk	52	11/30/2014
NO0010737174	Oslo Børs	Nelja Energia AS	59.03	6/30/2015
NO0010752298	Oslo Børs	Scatec Solar ASA	65	11/30/2015
NO0010790769	Oslo Børs	Lyse AS	65	4/30/2017
NO0010789464	Oslo Børs	Entra ASA	130	3/31/2017
NO0010774797	Oslo Børs	Entra ASA	130	9/30/2016
NO0010730872	Oslo Børs	DNB BANK ASA	130	2/28/2015
NO0010752702	Oslo Børs	Oslo Kommune	195	12/31/2015
NO0010720972	Oslo Børs	BKK AS	260	10/31/2014
XS1188118100	Oslo Børs	Kommunalbanken AS	500	2/28/2015

## Nasdaq Stockholm

ISIN	exchange	issuer	total issue (musd)	issue date
SE0009345630	Stockholm Nasdaq	Rikshem AB	18	11/30/2016
SE0007413299	Stockholm Nasdaq	Vasakronan AB	18.72	8/31/2015
SE0006800975	Stockholm Nasdaq	Vasakronan AB	19.2	2/28/2015
SE0009773211	Stockholm Nasdaq	Atrium Ljungberg AB	24	3/31/2017
SE0009806532	Stockholm Nasdaq	FABEGE AB	24	4/30/2017
SE0010101634	Stockholm Nasdaq	Humlegården Fastigheter AB	24	6/30/2017
SE0008294805	Stockholm Nasdaq	Rikshem AB	30	4/30/2016
SE0009357338	Stockholm Nasdaq	Västerås Stad	30	11/30/2016
SE0007666136	Stockholm Nasdaq	Vasakronan AB	32.04	10/31/2015
SE0009779457	Stockholm Nasdaq	Atrium Ljungberg AB	36	3/31/2017
SE0009356975	Stockholm Nasdaq	FABEGE AB	36	10/31/2016
SE0009606999	Stockholm Nasdaq	FABEGE AB	36	2/28/2017
SE0010023184	Stockholm Nasdaq	FABEGE AB	36	6/30/2017
SE0008406243	Stockholm Nasdaq	Hemsö Fastighets AB	36	6/30/2016
SE0008092787	Stockholm Nasdaq	Sveaskog AB	36	3/31/2016
SE0009580160	Stockholm Nasdaq	Svensk FastighetsFinansiering AB	36	2/28/2017
SE0007666128	Stockholm Nasdaq	Vasakronan AB	39.96	10/31/2015
SE0006220059	Stockholm Nasdaq	ARISE WINDPOWER AB	42	8/31/2014
SE0009161615	Stockholm Nasdaq	Castellum AB	42	4/30/2016
SE0007073903	Stockholm Nasdaq	Rikshem AB	42	5/31/2015
SE0009345622	Stockholm Nasdaq	Rikshem AB	42	11/30/2016
SE0007073895	Stockholm Nasdaq	Rikshem AB	48	5/31/2015
SE0009190606	Stockholm Nasdaq	Vasakronan AB	48	10/31/2016
SE0009190614	Stockholm Nasdaq	Vasakronan AB	48	10/31/2016
SE0009983802	Stockholm Nasdaq	Vasakronan AB	48	5/31/2017
SE0009190499	Stockholm Nasdaq	Skåne läns landsting	51	10/31/2016
SE0009607013	Stockholm Nasdaq	Vasakronan AB	58.8	2/28/2017
SE0005933231	Stockholm Nasdaq	Aligera Holding AB	60	7/31/2014
SE0009779465	Stockholm Nasdaq	Atrium Ljungberg AB	60	3/31/2017
SE0009241656	Stockholm Nasdaq	Svensk FastighetsFinansiering AB	60	10/31/2016
SE0009606759	Stockholm Nasdaq	Svensk FastighetsFinansiering AB	60	2/28/2017
SE0005798816	Stockholm Nasdaq	Vasakronan AB	60	3/31/2014
SE0006452553	Stockholm Nasdaq	Vasakronan AB	60	11/30/2014
SE0009357320	Stockholm Nasdaq	Västerås Stad	60	11/30/2016
SE0008241509	Stockholm Nasdaq	Vasakronan AB	66	4/30/2016
SE0008374011	Stockholm Nasdaq	FABEGE AB	72	5/31/2016
SE0009983810	Stockholm Nasdaq	Vasakronan AB	72	5/31/2017
SE0009161607	Stockholm Nasdaq	Castellum AB	78	4/30/2016
SE0008406235	Stockholm Nasdaq	Hemsö Fastighets AB	84	6/30/2016
SE0008092795	Stockholm Nasdaq	Sveaskog AB	84	3/31/2016
SE0009346422	Stockholm Nasdaq	Svensk FastighetsFinansiering AB	84	12/31/2016
SE0009921950	Stockholm Nasdaq	Volvofinans AB	84	5/31/2017
SE0009947500	Stockholm Nasdaq	Lunds Kommun	90	5/31/2017
SE0005798824	Stockholm Nasdaq	Vasakronan AB	90	3/31/2014
SE0009190481	Stockholm Nasdaq	Skåne läns landsting	93	10/31/2016
SE0008964415	Stockholm Nasdaq	Svensk FastighetsFinansiering AB	110.4	9/30/2016
SE0005906849	Stockholm Nasdaq	ARISE WINDPOWER AB	114.18	4/30/2014
SE0008431720	Stockholm Nasdaq	Södra Skogsägarna ekonomisk förening	120	6/30/2016
SE0009241425	Stockholm Nasdaq	Vasakronan AB	120	10/31/2016
SE0010101626	Stockholm Nasdaq	Humlegården Fastigheter AB	126	6/30/2017
SE0009773203	Stockholm Nasdaq	Atrium Ljungberg AB	132	3/31/2017
SE0007730247	Stockholm Nasdaq	Svensk FastighetsFinansiering AB	135.12	11/30/2015

## Borsa Italiana

ISIN	exchange	issuer	total issue (mUSD)	issue date
XS1586107101	Borsa Italiana	Société Générale	0.002	7/31/2017
XS1488416329	Borsa Italiana	World Bank	7.36	9/30/2016
XS1508504526	Borsa Italiana	World Bank	8.55	11/30/2016
XS1508503809	Borsa Italiana	World Bank	8.7	11/30/2016
XS1593538694	Borsa Italiana	World Bank	14.4	4/30/2017
XS1488416592	Borsa Italiana	World Bank	15.2	9/30/2016
XS1442211923	Borsa Italiana	World Bank	19.5	7/31/2016
XS1609294308	Borsa Italiana	World Bank	25	5/31/2017
XS1041094118	Borsa Italiana	EIB	38	3/31/2014
XS1550135088	Borsa Italiana	World Bank	46.8	2/28/2017
XS1550144668	Borsa Italiana	World Bank	47.4	2/28/2017
XS1315186921	Borsa Italiana	World Bank	56	11/30/2015
XS1442212145	Borsa Italiana	World Bank	57.6	7/31/2016
XS1198278175	Borsa Italiana	EIB	79.75	3/31/2015
XS1572222526	Borsa Italiana	EIB	150	3/31/2017
XS0994434487	Borsa Italiana	EIB	174.8	1/0/1900
XS0852107266	Borsa Italiana	EIB	261	11/30/2012
XS1280834992	Borsa Italiana	EIB	324.665	8/31/2015
XS1314336204	Borsa Italiana	EIB	400	11/30/2015
XS0773059042	Borsa Italiana	EIB	450	4/30/2012
XS1084043451	Borsa Italiana	Hera	590.3	7/31/2014
US45905URL07	Borsa Italiana	World Bank	600	3/31/2015
XS1536786939	Borsa Italiana	Poland	885.45	12/31/2016
US298785GQ39	Borsa Italiana	EIB	1000	10/31/2014
XS1641457277	Borsa Italiana	EIB	1180.6	7/31/2017
XS1268337844	Borsa Italiana	KfW	1298.701	7/31/2015
XS1550149204	Borsa Italiana	Enel	1475.75	1/31/2017
US298785HD17	Borsa Italiana	EIB	1500	4/30/2016
XS1107718279	Borsa Italiana	EIB	2125.08	9/30/2014
XS1260085037	Borsa Italiana	EIB	2125.08	7/31/2015
XS1051861851	Borsa Italiana	EIB	2337.662	4/30/2014
XS1107247725	Borsa Italiana	EIB	2538.29	9/30/2014
XS1183208328	Borsa Italiana	EIB	3187.62	2/28/2015
XS1247736793	Borsa Italiana	EIB	3836.95	6/30/2015
XS1271698612	Borsa Italiana	EIB	4368.22	8/31/2015
FR0013234333	Borsa Italiana	France	10190.94	6/30/2016

\* See the comment on the Borsa Italiana's green bonds under Figure 2.

## Luxembourg Stock Exchange

ISIN	exchange	issuer	total issue (musd)	issue date
XS0491921937	Luxembourg Stock Exchange	WorldBank	1.1	3/31/2010
US45905ULF92	Luxembourg Stock Exchange	WorldBank	5	7/31/2012
XS0862778833	Luxembourg Stock Exchange	WorldBank	5.52	10/31/2013
XS0945575347	Luxembourg Stock Exchange	WorldBank	8.9964	6/30/2013
XS1115487065	Luxembourg Stock Exchange	WorldBank	11.806	10/31/2014
XS0554265032	Luxembourg Stock Exchange	WorldBank	12	11/30/2010
XS0809448375	Luxembourg Stock Exchange	WorldBank	12.75	7/31/2012
XS1233786950	Luxembourg Stock Exchange	WorldBank	14.991	5/31/2015
XS0739611571	Luxembourg Stock Exchange	WorldBank	24.3	1/31/2012
XS1192988738	Luxembourg Stock Exchange	WorldBank	35.418	2/28/2015
XS1100166039	Luxembourg Stock Exchange	IFC	36.58	8/31/2014
XS1041094118	Luxembourg Stock Exchange	EIB	38	3/31/2014
XS1242327325	Luxembourg Stock Exchange	BRF SA	48.66433	6/30/2015
XS0941866252	Luxembourg Stock Exchange	WorldBank	49.4	6/30/2013
XS1386304395	Luxembourg Stock Exchange	WorldBank	50	4/30/2016
XS1249904597	Luxembourg Stock Exchange	WorldBank	50	7/31/2015
XS1315186921	Luxembourg Stock Exchange	WorldBank	56	11/30/2015
XS1092466033	Luxembourg Stock Exchange	WorldBank	59.03	8/31/2014
XS1073077023	Luxembourg Stock Exchange	RoadamcoSverige	78	6/30/2014
XS0490636791	Luxembourg Stock Exchange	WorldBank	79.05	3/31/2010
XS1198278175	Luxembourg Stock Exchange	EIB	79.75	3/31/2015
XS1618178567	Luxembourg Stock Exchange	Asian Development Bank	80	5/31/2017
US50049GAB86	Luxembourg Stock Exchange	Kommuninvest I Svergie AB	85.44	5/31/2017
XS1198022706	Luxembourg Stock Exchange	WorldBank	87	3/31/2015
XS1128441711	Luxembourg Stock Exchange	WorldBank	91.0421	1/31/2015
XS1073076991	Luxembourg Stock Exchange	RoadamcoSverige	102	6/30/2014
XS1201913651	Luxembourg Stock Exchange	WorldBank	103.275	4/30/2015
US50048MBX74	Luxembourg Stock Exchange	Kommunalbanken AS	107.2635	2/28/2015
XS0490347415	Luxembourg Stock Exchange	WorldBank	119.7	3/31/2010
XS1351716896	Luxembourg Stock Exchange	KfW	120	1/31/2016
XS1346202184	Luxembourg Stock Exchange	EIB	120	1/31/2016
XS1333145040	Luxembourg Stock Exchange	KfW	120	12/31/2015
XS1044956214	Luxembourg Stock Exchange	African Development Bank	120	3/31/2014
XS1036647565	Luxembourg Stock Exchange	African Development Bank	120	2/28/2014
XS1595814465	Luxembourg Stock Exchange	NedWaterBank	150	4/30/2017
XS1527751991	Luxembourg Stock Exchange	African Development Bank	150	11/30/2016
US50046PAU93	Luxembourg Stock Exchange	Kommuninvest I Svergie AB	154.76	3/31/2016
US29878TCS15	Luxembourg Stock Exchange	EIB	171.92	11/30/2015
US29878TCU60	Luxembourg Stock Exchange	EIB	186.08	9/30/2016
XS0485770241	Luxembourg Stock Exchange	WorldBank	189	2/28/2010



XS1490971634	Luxembourg Stock Exchange	EIB	213.92	9/30/2016
XS0955018261	Luxembourg Stock Exchange	EIB	216	7/31/2013
XS1314336204	Luxembourg Stock Exchange	EIB	228.08	11/30/2015
AU3CB0220424	Luxembourg Stock Exchange	WorldBank	237	4/30/2014
US05674XAA90	Luxembourg Stock Exchange	SuzanoAustria	240.752	7/31/2016
USA9890AAA81	Luxembourg Stock Exchange	SuzanoAustria	259.248	7/31/2016
XS0852107266	Luxembourg Stock Exchange	EIB	261	11/30/2012
US63983TBB08	Luxembourg Stock Exchange	NedWaterBank	266.69	3/31/2016
US45905UWE09	Luxembourg Stock Exchange	WorldBank	280	4/30/2016
US059614AP21	Luxembourg Stock Exchange	Banco Nacional de Desenvolvimento	287.893	5/31/2017
XS1564443759	Luxembourg Stock Exchange	Iberdrola Finanzas	295.15	3/31/2017
DE000NWB0AA4	Luxembourg Stock Exchange	NRWBank	295.15	11/30/2013
US30216BFY39	Luxembourg Stock Exchange	ExpDevCanada	300	12/31/2015
XS1646530565	Luxembourg Stock Exchange	LietuvosEnergij	354.18	7/31/2017
XS1555168951	Luxembourg Stock Exchange	NedWaterBank	360	1/31/2017
XS1551293019	Luxembourg Stock Exchange	EIB	360	1/31/2017
XS1188118100	Luxembourg Stock Exchange	Kommunalbanken AS	391.6365	2/28/2015
CA748148RW51	Luxembourg Stock Exchange	QuebecPr	400	3/31/2017
CA68323ACW23	Luxembourg Stock Exchange	Ontario	400	10/31/2014
XS1618289802	Luxembourg Stock Exchange	Kommuninvest I Svergie AB	414.56	5/31/2017
XS1078475024	Luxembourg Stock Exchange	WorldBank	420	6/30/2014
XS1383831648	Luxembourg Stock Exchange	Kommuninvest I Svergie AB	445.24	3/31/2016
XS0773059042	Luxembourg Stock Exchange	EIB	450	4/30/2012
US045167DR18	Luxembourg Stock Exchange	Asian Development Bank	500	8/31/2016
XS1437622548	Luxembourg Stock Exchange	BkChina	500	7/31/2016
US00828EBJ73	Luxembourg Stock Exchange	African Development Bank	500	12/31/2015
US045167CY77	Luxembourg Stock Exchange	Asian Development Bank	500	3/31/2015
US65562QAW50	Luxembourg Stock Exchange	Nordic Investment Bank	500	9/30/2014
XS1242327168	Luxembourg Stock Exchange	BRF SA	541.6357	6/30/2015
XS1640493372	Luxembourg Stock Exchange	NordeaBank	590.3	6/30/2017
XS1636000561	Luxembourg Stock Exchange	IntesaSanpaolo	590.3	6/30/2017
DE000NWB0AD8	Luxembourg Stock Exchange	NRWBank	590.3	11/30/2016
DE000NWB0AB2	Luxembourg Stock Exchange	NRWBank	590.3	11/30/2014
DE000NWB0AC0	Luxembourg Stock Exchange	NRWBank	590.3	10/31/2015
XS1437623355	Luxembourg Stock Exchange	BkChina	590.3	7/31/2016
XS1317148580	Luxembourg Stock Exchange	EIB	590.3	11/30/2015
XS1218319702	Luxembourg Stock Exchange	Unibail-Rodamco SE	590.3	4/30/2015
XS1197336263	Luxembourg Stock Exchange	VestasWindSyst	590.3	3/31/2015
XS1140300663	Luxembourg Stock Exchange	Verbund AG	590.3	11/30/2014
XS1084043451	Luxembourg Stock Exchange	Hera SPA	590.3	7/31/2014
XS1083955911	Luxembourg Stock Exchange	NedWaterBank	590.3	7/31/2014
XS1508534861	Luxembourg Stock Exchange	Kommuninvest I Svergie AB	600	10/31/2016
US45905URL07	Luxembourg Stock Exchange	WorldBank	600	3/31/2015
USP14486AM92	Luxembourg Stock Exchange	Banco Nacional de Desenvolvimento	712.107	5/31/2017
XS1437622621	Luxembourg Stock Exchange	BkChina	750	7/31/2016
US045167DQ35	Luxembourg Stock Exchange	Asian Development Bank	800	8/31/2016
XS1490726590	Luxembourg Stock Exchange	IberdrolaIntl	826.42	9/30/2016
XS1536786939	Luxembourg Stock Exchange	Poland	885.45	12/31/2016
XS1527758145	Luxembourg Stock Exchange	Iberdrola Finanzas	885.45	12/31/2016
XS1057055060	Luxembourg Stock Exchange	IberdrolaIntl	885.45	4/30/2014
XS1038708522	Luxembourg Stock Exchange	Unibail-Rodamco SE	885.45	2/28/2014
XS1386139841	Luxembourg Stock Exchange	NedWaterBank	983.31	3/31/2016

XS1437622977	Luxembourg Stock Exchange	BkChina	1000	7/31/2016
US500769GU24	Luxembourg Stock Exchange	KfW	1000	11/30/2015
US298785GQ39	Luxembourg Stock Exchange	EIB	1000	10/31/2014
XS1641457277	Luxembourg Stock Exchange	EIB	1180.6	5/31/2017
XS1575444622	Luxembourg Stock Exchange	Iberdrola Finanzas	1180.6	3/31/2017
XS1500338618	Luxembourg Stock Exchange	EIB	1180.6	10/31/2016
XS1414146669	Luxembourg Stock Exchange	KfW	1180.6	5/31/2016
XS1398476793	Luxembourg Stock Exchange	IberdrolaIntl	1180.6	4/30/2016
XS1284550941	Luxembourg Stock Exchange	NedWaterBank	1180.6	9/30/2015
CA68323ADL58	Luxembourg Stock Exchange	Ontario	1240	3/31/2016
XS1268337844	Luxembourg Stock Exchange	KfW	1298.701	7/31/2015
XS1550149204	Luxembourg Stock Exchange	EnelFlnt	1475.75	1/31/2017
US298785HM16	Luxembourg Stock Exchange	EIB	1500	5/31/2017
US500769HD99	Luxembourg Stock Exchange	KfW	1500	11/30/2016
US298785HD17	Luxembourg Stock Exchange	EIB	1500	4/30/2016
US500769GF56	Luxembourg Stock Exchange	KfW	1500	10/31/2014
XS1311459694	Luxembourg Stock Exchange	KfW	1770.9	10/31/2015
XS1087815483	Luxembourg Stock Exchange	KfW	1770.9	7/31/2014
XS1572222526	Luxembourg Stock Exchange	EIB	2066.05	3/31/2017
XS1107718279	Luxembourg Stock Exchange	EIB	2125.08	9/30/2014
XS1280834992	Luxembourg Stock Exchange	EIB	2243.14	8/31/2015
XS1051861851	Luxembourg Stock Exchange	EIB	2337.662	4/30/2014
LU0953782009	Luxembourg Stock Exchange	EIB	3541.8	7/31/2013



## London Stock Exchange

ISIN	exchange	issuer	total issue (mUSD)	issue date
XS1436728916	London Stock Exchange	SBAB BK 21	12	6/30/2016
XS1069349089	London Stock Exchange	STOCKHOLMS 20	27.6	5/31/2014
XS0976165828	London Stock Exchange	CITY GOTEBO 19	30	10/31/2013
XS0976166719	London Stock Exchange	CITY GOTEBO 19	30	10/31/2013
XS1239582684	London Stock Exchange	STOCKHOLMS 21	36	5/31/2015
XS1073488675	London Stock Exchange	CITY GOTEBO 20	37.2	6/30/2014
XS1402169848	London Stock Exchange	INT.FIN.21	42.75	4/30/2016
XS1031495929	London Stock Exchange	NORDIC 19	47.224	2/28/2014
US45950VGG32	London Stock Exchange	INT.FIN. 20	50.4	8/31/2015
XS1600978412	London Stock Exchange	FIRST.ADB. 18	60	9/30/2013
XS0824127277	London Stock Exchange	NORDIC 2.75%	60	9/30/2012
XS0975173633	London Stock Exchange	NORDIC 2.413%	60	9/30/2013
HK0000270386	London Stock Exchange	AGRI CHINA.17	90	10/31/2015
XS1069348941	London Stock Exchange	STOCKHOLMS 20	104.4	5/31/2014
XS1238024035	London Stock Exchange	RENEWI PLC.22	118.06	6/30/2015
XS1566936420	London Stock Exchange	CRED AG CO 22	120	1/0/1900
XS1436518606	London Stock Exchange	SBAB BK 21	120	6/30/2016
XS1222727536	London Stock Exchange	NORDIC 20	120	4/30/2015
XS1433082861	London Stock Exchange	CITY GOTEBO 22	120	6/30/2016
XS1347786797	London Stock Exchange	NORDIC 21	120	1/31/2016
XS1253847815	London Stock Exchange	CITY GOTEBO 21	126	6/30/2015
XS1627778316	London Stock Exchange	CITY GOTEBO 23	144	7/31/2017
XS1239582502	London Stock Exchange	STOCKHOLMS 21	180	5/31/2015
XS1073521988	London Stock Exchange	CITY GOTEBO 20	180	6/30/2015
XS1494406074	London Stock Exchange	NORDIC 23	180	9/30/2016
XS1420355023	London Stock Exchange	STOCKHOLMS 21	180	5/31/2016
US29874QCN25	London Stock Exchange	EURO.BK. 18	250	4/30/2017
XS1117504750	London Stock Exchange	DEV.BK.J. 17	295.15	1/0/1900
XS1467374473	London Stock Exchange	NTPC 7.375%21	320	8/31/2016
XS1048655184	London Stock Exchange	UNILEVER 18	324.6753	3/31/2014
XS1659112616	London Stock Exchange	ANG.W.S.F. 25	324.6753	8/31/2017
XS1309485701	London Stock Exchange	DEV.BK.J. 19	354.18	10/31/2015
XS1308276168	London Stock Exchange	AGRI CHINA.18	400	10/31/2015
XS1498532271	London Stock Exchange	MUNICIPALTY 21 S	500	10/31/2016
XS1512929842	London Stock Exchange	BK. CHINA 19	500	11/30/2016
US05463CAD48	London Stock Exchange	AXIS BK 21 144A	500	6/30/2016
XS1410341389	London Stock Exchange	AXIS BK 21 REGS	500	6/30/2016
XS1303791336	London Stock Exchange	AGRI CHINA.20	500	10/31/2015
US62630CAH43	London Stock Exchange	MUNICIPALTY 21 A	500	10/31/2016
US45950VHE92	London Stock Exchange	INT.FIN. 18	500	11/30/2015
XS1222743061	London Stock Exchange	TRANSPORT LDN25	519.4805	4/30/2015
XS1587035996	London Stock Exchange	FIRST.ADB. 22	587	1/0/1900
XS1292474282	London Stock Exchange	NORDIC.22	590.3	9/30/2015
US29874QCW24	London Stock Exchange	EURO.BK.19	650	7/31/2016
XS1431730388	London Stock Exchange	NORDIC 24	1180.6	6/30/2016
US45950VHX73	London Stock Exchange	INT.FIN. 26	1200	4/30/2016

## Survey of green bond exchanges

### Stockholm Nasdaq

	Stockholm Nasdaq
Are there any <u>extra</u> fees payable on listing green bonds on your exchange (compared to regular bonds)? (Y/N) [This question is only for exchanges:	N
If yes, details of the fees	
Expected growth of exchange traded green bond market in 2018 (%) (in terms of listed papers, market trades, etc)	We believe the number of bonds on Nasdaq Stockholm will increase by approximately 50% during 2018. From 71 to somewhere in the 100's.
Experience with green bond listings	
Greatest challenges of green bond listings	Setting up standards for companies in new industries.
Green bond plans for 2018 and 2019	Expand our green bond listings to other local Nasdaq-exchanges (Helsinki, Baltics, Copenhagen, Iceland etc.)
Further comments:	

### Luxembourg Stock Exchange

	Luxembourg Stock Exchange
Are there any <u>extra</u> fees payable on listing green bonds on your exchange (compared to regular bonds)? (Y/N) [This question is only for exchanges:	The listing fees for green bonds and non-green bonds are the same. No additional fees apply for admission onto the Luxembourg Green Exchange (LGX) platform.
If yes, details of the fees	
Expected growth of exchange traded green bond market in 2018 (%) (in terms of listed papers, market trades, etc)	
Experience with green bond listings	<p>As the pioneer in the listing of the very first green bond ever issued (2007 European Investment Bank Climate Awareness Bond), the Luxembourg Stock Exchange has extensive experience with green bonds. LuxSE not only helped shape the market from its early beginnings, today it has the highest number of green, social and sustainability bonds listed and admitted to trading. There are 159 bonds admitted on the LGX platform, worth USD 95.05 billion in 17 currencies from 42 issuers (31/01/2018). Of those bonds, 139 are green, representing USD 82.91 billion and 35 issuers. With green bond issuers from 21 countries spanning 5 continents, LGX has a truly international coverage. On top of that, more self-labelled green bonds are listed on the Luxembourg Stock Exchange without being displayed on the LGX platform.</p> <p>Over the years, LuxSE has also built a product specific expertise far beyond regular green, social, and sustainability bonds. It listed the first sovereign green bond (issued by the Republic of Poland) and has listed innovative products such as green covered bonds (e.g. Sparebank 1 Boligkreditt) and hybrid green bond (e.g. Ørsted and Iberdrola). Furthermore, LuxSE has developed an in-house expertise on green bond market standards, external reviews, post issuance reporting, and the approval of green bond prospectuses for the exchange-regulated Euro MTF market.</p>
Greatest challenges of green bond listings	<ul style="list-style-type: none"> <li>• How to ensure that disclosure of the use of proceeds is exhaustive, material and in line with an international taxonomy;</li> <li>• Reporting: How to assess the quality of reporting and determine minimum levels of information, how to ensure reporting quality, including impact reporting, which could be applicable across different issuer types and industry sectors, and how to ensure comparability in a context of multiple metrics, KPIs and reporting styles;</li> <li>• There is currently a lack of supply of bankable projects to be brought to capital markets.</li> </ul>
Green bond plans for 2018 and 2019	
Further comments:	

## London Stock Exchange

	London Stock Exchange
Are there any <u>extra</u> fees payable on listing green bonds on your exchange (compared to regular bonds)? (Y/N) [This question is only for exchanges:	No, there are no additional fees for listing green bonds vs. vanilla bonds on London Stock Exchange
If yes, details of the fees	n/a
Expected growth of exchange traded green bond market in 2018 (%) (in terms of listed papers, market trades, etc)	LSE is seeing significant growth in green bond issuance with 2017 representing a record year in terms of number of deals and volume raised. In 2017, issuers on our markets raised \$10.1bn equivalent in green bonds, representing a 78% increase vs. 2016. In terms of number of issuances, compared to 14 green bonds which raised \$5.65 billion in 2016, 2017 saw 27 new green bonds admitted – a 93% increase. We anticipate growth in the asset class to increase in 2018 as green financing continues to become more mainstream.
Experience with green bond listings	<p>In total, there are 64 green bonds listed in London that have raised over \$20.67 billion in aggregate terms across seven currencies. London Stock Exchange is also the listing venue of the first green bonds out of China, India and the Middle East. Key wins in 2017 include:</p> <ul style="list-style-type: none"> <li>- National Bank of Abu Dhabi issued a \$587m green bond on LSE in March 2017 under its \$7.5bn MTN programme. This landmark transaction represents an important milestone for green finance being the first Green Bond deal from the Gulf region.</li> <li>- IFC's first Social Bond Program raised \$500m for women-owned companies and low income communities in developing countries in March 2017.</li> </ul>
Greatest challenges of green bond listings	<p>One of the biggest challenges of green bond issuance is the perception of the difficulty of the process vs. issuing a vanilla bond. London Stock Exchange spends a lot of time working with issuers to educate them around the process and what it involves in order to dispel this idea.</p> <p>Increasingly, another area of concern for green bond issuance is around transparency and the role of exchanges in promoting the ongoing green disclosure obligations and ongoing reporting. LSE gets heavily involved in all initiatives to provide thought leadership around how we can move towards standardisation of standards in the green space, and how we can help promote transparency of green bonds over the lifetime of their issuance. One such example is the ESG Reporting Guidance we published which gives issuers useful insight into what they should be disclosing in relation to their ESG endeavours for resonate most effectively with investors</p>
Green bond plans for 2018 and 2019	In 2018 and 2019 we anticipate we will continue to see strong growth in the green space. We predict that more issuers will choose to issue debut bonds in green format so as to maximise their investor diversification, and equally we will continue to see more international issuers tapping the market. We will continue to work with international issuers and various stakeholders to boost this activity.
Further comments:	

## Oslo Børs

	Oslo Børs
Are there any <u>extra</u> fees payable on listing green bonds on your exchange (compared to regular bonds)? (Y/N) [This question is only for exchanges:	No extra fees
If yes, details of the fees	N/A
Expected growth of exchange traded green bond market in 2018 (%) (in terms of listed papers, market trades, etc)	N/A
Experience with green bond listings	Dedicated list for green bonds
Greatest challenges of green bond listings	In our market, limited local investor interest as a result of few Norwegian investors having dedicated green investment mandates is a challenge. Another challenge is that potential issuers appear to have insufficient knowledge about the advantages of issuing green bonds.
Green bond plans for 2018 and 2019	Continue our current work with market education and facilitating investor-issuer dialogue in order to grow the number of green bond listings in our market
Further comments:	