



Verification Report for Pre-Issuance Certification of the Green Bond Programme to be launched by Landesbank Baden-Württemberg

18 December 2017

Scope

Landesbank Baden-Württemberg (LBBW) commissioned oekom research to compile a Verification Report for Pre-Issuance Certification of its Green Bond Programme by the Climate Bond Initiative (CBI). The Climate Bond Certification process includes verifying whether the provisions of the Climate Bond Standard issued by the CBI are met and obtaining evidence to support the verification.

Criteria

Relevant CBI Standards for this Climate Bond Certification:

- Climate Bond Standard (Climate Bond Standard Version 2.1; status 01/2017)
- Low Carbon Buildings
 - Commercial Property Guidance Document (Version 1.0; status 03/2016)
 - Upgrade Projects Guidance Document (Version 1.0; status 03/2016)

LBBW's Responsibility

LBBW's responsibility was to provide information and documentation on:

- Selection of nominated projects & assets
- Internal processes & controls
- (Proposed) reporting

Independence and Quality Control

oekom research is managerially and economically independent. Its independence is guaranteed through registered shares with restricted transferability, rigorous codes of conduct for every analyst and the fact that neither consulting services nor asset management services are offered. oekom research can thus guarantee a high degree of credibility and objectivity for its research findings. Regular audits by an independent institution against the European voluntary quality standard for responsible investment ARISTA® attest oekom's extensive quality standards which are complemented by a comprehensive quality management system.

oekom's Responsibility as a Verifier

oekom research reviewed the information and documentation provided and developed by LBBW to assess the Green Bond Programme's alignment with the CBI requirements:

- Conformance with the selection of nominated projects & assets requirements
- Conformance with the internal processes & controls requirements
- Conformance with the reporting requirements

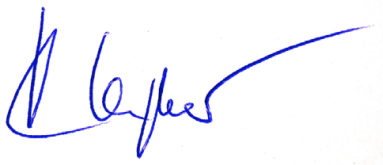
oekom research's approach to assess whether the issuer meets the criteria of the CBI standard was as follows. The issuer provided an overview over the assets to be included in the Green Bond asset pool and the relevant processes regarding the proceeds (e.g. use of proceeds, management of proceeds) to oekom research. Further, the issuer needed to fill in a questionnaire that covers all criteria of the Climate Bond Standard 2.1. Additionally, the issuer had to provide background documents that elaborate further on the information mentioned in the questionnaire. With the help of this questionnaire and the background documents, oekom research carried out a desk-based assessment of the CBI criteria. In case any answers were unclear, oekom research contacted the issuer for more details and clarification.

Restriction on Distribution and Use of Report

This Verification Report for Climate Bond Certification including all documentation provided alongside is intended for the use of LBBW and the Climate Bond Standard Board. The present document may be published by LBBW, CBI and oekom research. CBI and oekom research agree to publish the report with the consent of LBBW.

Opinion

Based on the limited assurance procedures conducted on LBBW's Green Bond Programme, oekom research found no evidence for non-conformance with the Climate Bond Standard's requirements.



Robert Haßler, CEO

oekom research AG

Munich, 18 December 2017

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About oekom research

oekom research is one of the world's leading rating agencies in the field of sustainable investment. The agency analyses companies and countries with regard to their environmental and social performance. oekom research has extensive experience as a partner to institutional investors and financial service providers, identifying issuers of securities and bonds which are distinguished by their responsible management of social and environmental issues. More than 100 asset managers and asset owners routinely draw on the rating agency's research in their investment decisionmaking. oekom research's analyses therefore currently influence the management of assets valued at over 600 billion euros.

As part of our Green Bond Services, we provide support for companies and institutions issuing sustainable bonds, advise them on the selection of categories of projects to be financed and help them to define ambitious criteria. We verify the compliance with the criteria in the selection of projects and draw up an independent second party opinion so that investors are as well informed as possible about the quality of the loan from a sustainability point of view.

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Annex

- Annex 1: Detailed Findings
- Annex 2: LBBW Green Bond Framework
- Annex 3: LBBW Green Bond Assessment Methodology

Annex 1: Detailed Findings

1. Selection of nominated projects & assets

	Requirement	Factual Findings	Analysis against Requirements
1.1.	Decision-making process to determine eligibility of nominated projects & assets	LBBW has defined a set of environmental objectives (i.e. to channel investments to assets that have climate benefits and thereby contribute to the achievement of the UN Sustainable Development Goals (SDGs)) and has implemented processes to determine the eligibility of nominated assets.	✓
1.2.	Assessment of proposed nominated projects & assets	LBBW assesses all proposed assets against its self-defined eligibility criteria, which meet the bond's objectives. As only a sub pool of the portfolio will be compliant with the eligibility criteria under Part B of the Climate Bond Standard, LBBW will flag these within the internal IT system.	✓
1.3.	Documentation of eligibility of nominated projects & assets	LBBW has developed and established a selection process based on self-defined eligibility criteria. Nominated assets are flagged within the internal IT system.	✓
1.4.	No double nomination of projects & assets	LBBW will keep a ledger to ensure assets are not nominated twice.	✓

	Requirement	Factual Findings	Analysis against Requirements
1.5.	Net proceeds in relation to issuer's debt obligation	LBBW has identified an eligible portfolio and will continuously expand the asset pool by new eligible assets to ensure that LBBW's debt obligation to the nominated assets always exceed the total balance of all outstanding Green Bonds.	✓

2. Internal Processes & Controls

	Requirement	Factual Findings	Analysis against Requirements
2.1.1.	Tracking of proceeds	LBBW will track the proceeds using an internal IT system. LBBW commits on a best effort basis to allocate all Green Bond proceeds within one year of the Green Bond issuance.	✓
2.1.2.	Managing unallocated proceeds	LBBW states that temporarily unallocated proceeds will be held and/or invested in LBBW'S liquidity portfolio in money market instruments.	✓
2.1.3.	Earmarking funds to nominated projects & assets	LBBW has established an earmarking process to manage and account for the nominated assets.	✓

3. Reporting Prior to Issuance

	Requirement	Factual Findings	Analysis against Requirements
3.1.1.	Disclosure on investment areas	LBBW has ensured that prior to issuance it will disclose the CBI investment areas into which the selected assets fall.	✓
3.1.2.	Disclosure on intended types of temporary investment instruments	LBBW has ensured that it will disclose the intended types of temporary investment instruments prior to issuance.	✓
3.1.3.	Disclosure regarding pre-issuance verification	LBBW has ensured that it will disclose prior to issuance its application for CBI verification.	✓
3.1.4.	Disclosure on periodic assurance engagements	LBBW plans post-issuance assurance engagements to reaffirm conformance with the Climate Bonds Standard and will report on this fact.	✓

Annex 2: LBBW Green Bond Framework

Landesbank Baden-Württemberg (LBBW) Green Bond Framework

Stuttgart, 5 Dezember 2017

1. Introduction

1.1. Background

Landesbank Baden-Württemberg ('LBBW') is both a universal bank and a commercial bank with a regional focus.

LBBW has total assets of around EUR 244 billion (as at 31 December 2016) and a staff of approx. 10,840 within the Group. Its head offices are located in Stuttgart, Karlsruhe, Mannheim and Mainz.

Its three customer-driven banks - BW-Bank, LBBW Rheinland-Pfalz Bank and LBBW Sachsen Bank - allow LBBW to offer the full array of business services across Germany, while also drawing on extensive regional roots. Within the state capital Stuttgart, BW-Bank fulfils the role of a municipal savings bank for LBBW.

LBBW's business model is based on five pillars and comprises the following areas of business: corporate customers, private customers, savings banks, real estate financing, project finance and capital markets. BW-Bank, LBBW Rheinland-Pfalz Bank and LBBW Sachsen Bank as dependent institutions with their own market presence form the three strong regional pillars in the Group's business with private and corporate customers.

LBBW also supports both its own corporate customers and those of the affiliated savings banks with their international activities. Branches and representative offices around the world provide support through their country expertise, market knowledge and finance solutions. In addition, LBBW operates German Centres in selected locations that provide local offices and networks to German corporate customers and advise them on their market entry.

Subsidiaries specializing in specific areas of business such as leasing, factoring, asset management, real estate or equity finance diversify and amplify LBBW's portfolio of services within the Group.

1.2. LBBW's sustainability ambitions

LBBW is a member of the UNEP Finance Initiative since 1999 and has since developed strong sustainability policies and goals. LBBW's Sustainability Policy provides guidelines that form a framework for all sustainability activities at LBBW and therefore forms the basis for integrating economic, environmental, and social issues into our business activities as a whole. For purposes of implementing

the Sustainability Policy, LBBW has defined overarching goals, which are broken down into individual targets and specific measures, and put into operation in the annual Sustainability Program. The Principles and Guidelines for Implementation of LBBW's Sustainability Policy and Goals provide concrete guidance for implementation of the umbrella sustainability goals, which include specific exclusion criteria for certain planned transactions along with overarching compliance, human rights, LBBW climate strategy and business area-specific guidelines (for further information please see [Sustainability Report 2016](#), pages 12-20).¹

In addition LBBW's code of conduct also includes no-tolerance policy towards corruption, fraud or money laundering, the protection of data and intellectual property, compliance with all relevant laws and regulations and a good corporate citizenship in general.

Regarding the protection of environment, LBBW has already achieved its aim to reduce CO₂ emissions in business operations by one-quarter by 2020 (starting from 2009 figures).

While backing all of the 17 “Sustainable Development Goals” (SDGs), as defined in September 2015 by the United Nations for the period 2015-2030, LBBW can predominantly contribute to these goals in its own areas of competence covering a broad range of financing solutions in order to:

- Support the sustainable development of companies
- Promote projects which contribute to the fight against climate change, notably through LBBW's commercial real estate and project financing activities.

1.3. Rationale

LBBW is convinced that Green Bonds are an effective tool to channel investments to assets that have climate benefits and thereby contribute to the achievement of the UN SDGs, particularly SDG 11 (sustainable cities and communities) SDG 13 (Climate Action), SDG 7 (Affordable and Clean Energy) LBBW has been a signatory of the ICMA Green Bond Principles since 2014. LBBW believe that Green Bonds offer transparency and traceability to investors who wish to allocate funds to green assets. LBBW hopes to broaden its investor base by attracting investors that seek to focus their investments towards environmentally friendly projects. LBBW has designed therefore this Green Bond Framework in accordance with the ICMA Green Bond Principles 2017², to provide investors with a state of the art green bond, in line with the market practice in terms of transparency, impact reporting, and commitments. As one of the first German financial institution entering the green bond market, LBBW believes also it has a key role to play as a standard setter in Germany.

¹ https://www.lbbw.de/media/verantwortung/pdf_nachhaltigkeit/LBBW_Sustainability-Report_2016.pdf

² <https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/GreenBondsBrochure-JUNE2017.pdf>

2. Application of ICMA Green Bond Principles 2017

LBBW has created this Green Bond Framework in accordance with ICMA Green Bond Principles 2017, and elected to issue Green Bond(s) with particular focus on the following areas:

- Green buildings financing
- Renewable energy projects financing

The ICMA Green Bond Principles are a set of voluntary guidelines that recommend transparency and disclosure and promote integrity in the development of the green bond market by clarifying the approach for issuing a green bond. In alignment with the ICMA Green Bond Principles 2017, LBBW's Green Bond Framework is presented through the following key pillars:

1. Use of Proceeds
2. Process for Project Evaluation and Selection
3. Management of Proceeds
4. Reporting
5. External review

For each Green Bond issued, (i) Use of Proceeds (ii) Project Evaluation and Selection (iii) Management of Proceeds, (iv) Reporting, and (v) External review will be adopted subject to and in accordance with this Green Bond Framework as amended from time to time.

A dedicated Green Bond Committee has been established to create this Green Bond Framework, manage any future updates to the Framework, including expansions to the list of Eligible Categories, and oversee its implementation.

The committee consists of representatives of the Treasury, the Risk department and the Sustainability department.

2.1. Use of Proceeds

The net proceeds of Green Bond issuances will be used exclusively to finance or refinance in whole or in part an Eligible Green Loan Portfolio consisting of Eligible Green Loans in the following Eligible Categories:

- **Green commercial buildings** which meet regional, national or internationally recognized regulations, standards or certifications in either:

- (i) New or existing commercial buildings belonging to top 15% low carbon buildings in Germany, in accordance with the methodology defined by an external specialized consultant in green buildings, Drees & Sommer Advanced Building Technologies GmbH.

The methodology, which is defined by Drees & Sommer Advanced Building Technologies GmbH as a green bond standard for commercial real estate in Germany can also be used by other participants in the green bond market, notably includes the following criteria for German commercial buildings:

- i. German office and retail buildings from 2007 with an Energy Performance Certificate under EnEV³ 2007 regulation and later⁴.
- or
- ii. German office buildings from 1995 and German retail buildings from 1985 with a maximum site energy consumption of 120 kWh/m²/a (assumption based on research from German Energy Agency Dena). The German Energy Passport for commercial buildings (Energieausweis Nichtwohngebäude) is an example of an instrument that LBBW will use to verify compliance.
- (ii) Refurbished buildings: All German refurbished buildings that have undergone a major refurbishment since 2007 under EnEV regulation. The energy demand of buildings which have been undergone this major refurbishment is maximally 40% above the energy demand of a comparable new building
 - (iii) New, existing or refurbished green buildings which received at least following classifications: LEED “Silver”, DGNB “Silver”, BREEAM “Very Good”, ENERGY STAR “70” or equivalent or higher level of certification. The certified buildings must also have a good energy performance.
- **Renewable energy projects**, defined as the financing or as investments in or expenditures for the acquisition, conception, construction, development and installation of renewable energy production units; as well as the connection of renewable energy production units to the electricity grid and the transportation through the network. Renewable energy sources include:
 - (i) On- and offshore wind energy
 - (ii) Solar energy

2.2. Process for project evaluation and selection

The Green Bond Committee will oversee the entire Green Bond process, including the evaluation and selection of eligible loans originated across relevant business lines.

For the Eligible Loan Category which fall under the category green commercial buildings, LBBW has relied on the support of an external real estate expert consultant Drees & Sommer Advanced Building Technologies GmbH to (1) define the associated eligibility criteria for the top 15% of low carbon buildings and the eligible regulations, standards and certifications and (2) to identify the buildings that

³ EnEV – Energieeinsparverordnung (Ordinance on the Implementation of the Energy Saving Act EnEG). The buildings are calculated using a standardized calculation method in accordance with DIN V 185996.

⁴ This is a very conservative approach since all German office buildings from 1995 and all German retail buildings (non-food) constructed after 1985 are potentially part of the top 15% of the local market.

comply with these criteria within LBBW's existing portfolio of commercial real estate (CRE). The consultant will also identify which part of the Eligible Green Loan Portfolio is in line with the criteria in the Climate Bonds Initiative standards and guidance on low carbon buildings⁵. For newly originated loans, i.e. loans which will be originated after LBBW's inaugural issuance, and for existing loans for which detailed information has become available (such as building certifications or German energy passports) the Green Bond committee will oversee the process for evaluation and selection of eligible loans according to the methodology defined by the consultant. LBBW will in this way gradually expand the Eligible Green Loan Portfolio.

LBBW takes care that all selected Eligible Assets comply with official national and international environmental and social standards and local laws and regulations on a best effort basis. It is part of LBBW's transaction approval process to take care, that all its activities comply with internal environmental and social directives. LBBW has minimum environmental and social requirements in place for all lending businesses, including those financed with the proceeds of the Green Bonds. These eligibility criteria and minimum requirements and ESG related are continuously developed and renewed in its external and internal policy frameworks. LBBW's environmental and social policies can be found on:

https://www.lbbw.de/en/verantwortung/verantwortung_start/verantwortung_und_nachhaltigkeit.jsp

2.3. Management of proceeds

The Green Bonds proceeds will be managed by LBBW in a portfolio approach.

LBBW intends to allocate the proceeds from the Green Bonds to a portfolio of loans that meet the use of proceeds eligibility criteria and in accordance with the evaluation and selection process presented above, the Eligible Green Loan Portfolio.

LBBW intends to allocate all green bond proceeds to the Eligible Green Loan Portfolio within one year of the Green Bond issuance.

LBBW intends to designate sufficient eligible loans in the Eligible Green Loan Portfolio to provide that its outstanding balance of Eligible Green Loans always exceeds the total balance of all outstanding Green Bonds. For each new Green Bond issuance, where necessary, additional Eligible Green loans will be added to this Eligible Green Loan Portfolio pool to provide for sufficient and timely allocation of the incremental net proceeds. During the life of the Green Bonds, if a loan ceases to fulfil the eligibility criteria, LBBW will use its best efforts to remove the loan from the Eligible Green Loan Portfolio and replace it when necessary for the balance of the portfolio as soon as reasonably practicable.

Whilst any Green Bond net proceeds remain unallocated, LBBW will hold and/or invest, at its own discretion, in its liquidity portfolio in money market instruments, the balance of net proceeds not yet allocated to eligible loans.

⁵ <https://www.climatebonds.net/files/files/Commercial%20Property%20Criteria.pdf>

2.4. Reporting

The Green Bond Principles require green bond issuers to provide information on the allocation of proceeds. In addition to information related to the projects to which green bond proceeds have been allocated, the Green Bond Principles recommend communicating on the expected impact of the projects.

On a best effort basis LBBW will align the reporting with the portfolio approach described in "Green Bonds- working towards a Harmonized Framework for Impact Reporting (December 2015)"⁶. The reporting basis for all LBBW green bonds and other potential green funding is the Eligible Green Loan Portfolio and will be aggregated for all green bonds outstanding.

Allocation Reporting

Allocation reporting will be available to investors within one year from the date of each Green Bond transaction and annually thereafter until the proceeds have been fully allocated. The report will provide, for each Eligible Category:

- the total amount of proceeds allocated to eligible loans
- the number of eligible loans
- the balance of unallocated proceeds
- the amount or the percentage of new financing and refinancing

Additionally, when appropriate and subject to confidentiality obligations, LBBW may provide concrete examples of eligible assets refinanced through the proceeds of the Green Bonds.

Impact Reporting

LBBW commits on a best effort basis to report yearly and until full allocation on climate benefits associated to the eligible loans, i.e. :

- For Green buildings eligible loans on:
 - Estimated ex-ante annual energy consumption in KWh/m²/a or energy savings in MWh
 - Estimated annual GHG emissions reduced/avoided in tons of CO2 equivalent
- For Renewable Energy eligible loans on:
 - Installed capacity in MWh
 - Annual GHG emissions reduction in tons of CO2 equivalent

For the Green buildings Eligible category, LBBW has appointed a specialized consultant to develop the methodology for the estimation and calculation of the impacts that will be made publically available. Where reasonably feasible, LBBW will seek to provide data on a building basis but due to confidentiality reasons will also choose to aggregate certain classes of buildings.

⁶ <https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/20151202-0530-FINALRevised-Proposal2.pdf>

Both allocation report and impact report will be made available via the LBBW's website:

www.lbbw.de/greenbond

To offer maximum transparency to investors LBBW will also strive to deliver such impact estimates in an investor presentation alongside with the issuance of each Green Bond.

2.5. External review

2.5.1. Second party opinion

Prior to issuance, LBBW has commissioned oekom research AG to obtain an external sustainable verification of its Green Bond Framework. Oekom has reviewed LBBW's green bond framework and issued a second opinion confirming the alignment of it with the Green Bond Principles and the framework's strong environmental credentials. Under this framework the issuance of multiple Green Bonds is possible.

LBBW will put a link to the document on the website of the Second Party Opinion provider in the Green Bond section of LBBW's Investor Relations webpage.

The Climate Bond Initiative certification of LBBW's inaugural bond is included in the scope of the work of the Second Party Opinion.

2.5.2. Verification post issuance

LBBW has appointed oekom to perform for the coming three years following the first issuance, an annual update of its SPO on the Green Bond Programme once. The mission of oekom will notably consist in verifying the sustainability soundness (environment and social risk management and potential controversies) of the assets that will have been added to the portfolio since first issuance. At the end of its mission, oekom will provide an updated version of its SPO report that will be published by LBBW.

Annex 3: LBBW Green Bond Assessment Methodology



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1 Conclusion

The biggest challenge in the development of a Green Bond assessment methodology for the selection of German buildings was to find a suitable data basis for the energy consumption of the building stock depending on the building age. Other countries such as the Netherlands or the USA demonstrate how a maximum degree of transparency for building energy performance in existing buildings can be achieved. With the energy performance certificates of the EnEV, there is already an excellent instrument in Germany for the energetic evaluation of buildings. However, there is still a lack of a central national register in which the results of the energy performance certificates are mandatory. Such a data basis would eliminate the need for approaches such as those outlined in this paper.

1.1 German Commercial Real Estate Assessment Methodology

The aim of the initial building selection at the end of 2017 is to develop an easily applicable but nevertheless reliable assessment methodology with a limited amount of data (e. g. no energy consumption data of the buildings available).

The LBBW's objective is to identify a portfolio that is aligned with the guideline of Climate Bonds Initiative (CBI) to ensure that the carbon performance of the selected commercial buildings is among the Top 15% of the local building stock¹. The building selection therefore relates primarily to the energy efficiency of buildings and not to the existence of green building certificates, as this has already been the case with the issuance of other Green Bonds. With this method, the carbon performance of the LBBW Green Bond initial building selection is defined depending on the national legislation on building energy efficiency at the building year without knowing the actual energy consumption² (see also Figure 6 and Figure 7 as well as the calculation example in the appendix, chapter 3).

Since the measured energy consumptions³ are not available, the energy performance of the buildings has to be evaluated according to the theoretical energy demand⁴. In Germany, energy demand has been determined since 2007 according to the same basic method, only the target values have been gradually tightened. For this purpose, the buildings energy demands are calculated using a standardized calculation method in accordance with DIN V 18599⁵ and an energy performance certificate according to EnEV⁶ is issued on this basis. The German government is thus implementing the European Building Directive EPBD⁷, which applies to all EU member states. The relationships between the various legal requirements can be seen in Figure 1.

¹<https://www.climatebonds.net/files/files/Commercial%20Property%20Criteria.pdf>

² Carbon Emissions [kgCO₂] = Energy Consumptions [kWh/a] x CO₂ Emission Factors [kgCO₂/kWh]

³ Energy consumption = actually measured energy consumption which has to be paid

⁴ Energy demand = theoretically determined energy requirement, which is usually calculated within the design phase under normalized conditions

⁵ DIN V 18599 – Standard series for calculating the building energy demand

⁶ EnEV – Energieeinsparverordnung (Directive of the Energy Saving Act / EnEG)

⁷ EPBD – Energy Performance of Buildings Directive

The conservative approaches for the selection of German office and retail buildings built in 2007 and later ensures that these buildings will be among the Top 15 % (and even significantly better than the Top 15%). As the energy quality of the buildings has been continuously improved, the building year is a reliable criterion for the selection method of the Top 15 % of German office and retail buildings.

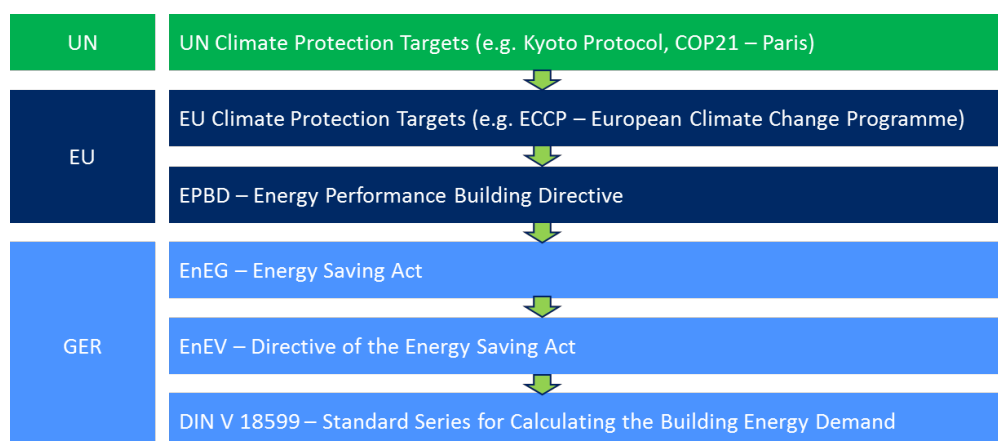


Figure 1: Legal requirements from UN to national level

1.1.1 German Office Building Selection

In Germany, 38% (968 TWh) of the national site energy demand is caused by buildings and 65% of this is accounted for by residential buildings (approx. 18.2 million buildings) and 35% by commercial buildings (approx. 300,000 office and approx. 500,000 retail buildings)⁸. Conversely, this means that the commercial buildings are one of the main CO₂ emitters.

To obtain information on carbon performance, correlated with energy performance, of the Top 15% of German office buildings⁹, a data basis is required that includes both specific energy data and the associated building age classes. The dena¹⁰ study "Office properties - energy efficiency and incentives for increasing energy efficiency"¹¹ contains for the first time this information for office buildings and will therefore be used. The study clearly shows the correlation between increasing energy efficiency and later building age class for office buildings (see Figure 2). Together with the distribution of buildings according to building age class (i. e. when and how many new buildings were erected, see Figure 3) the Top 15% can be clearly distinguished. Due to the low rate of new construction, the office buildings with the building age class 1995-2002 belong on average to the Top 15% of Ger-

⁸https://www.zukunft-haus.info/fileadmin/media/05_gesetze_verordnungen_studien/dena-Gebaudereport_2012_fi-nal.pdf

⁹ The assessment approach takes as a basis that the local building market is mainly supplied with similar primary energy sources.

¹⁰ Dena – Deutsche Energie-Agentur (German Energy Agency)

¹¹https://shop.dena.de/fileadmin/denashop/media/Downloads_Dateien/bau/9196_Bueroimmo-bilien_Energetischer_Zustand_Anreize_Steigerung_Energieeffizienz.pdf

man office buildings. For the building age class 1995-2002, average specific energy demands for heat with 177 kWh/m²/a and electricity with 39 kWh/m²/a are given¹². A conservative approach is chosen to use these parameters as a reliable limit value for the Top 15% and to avoid buildings of this building age class with a significantly higher energy demand.

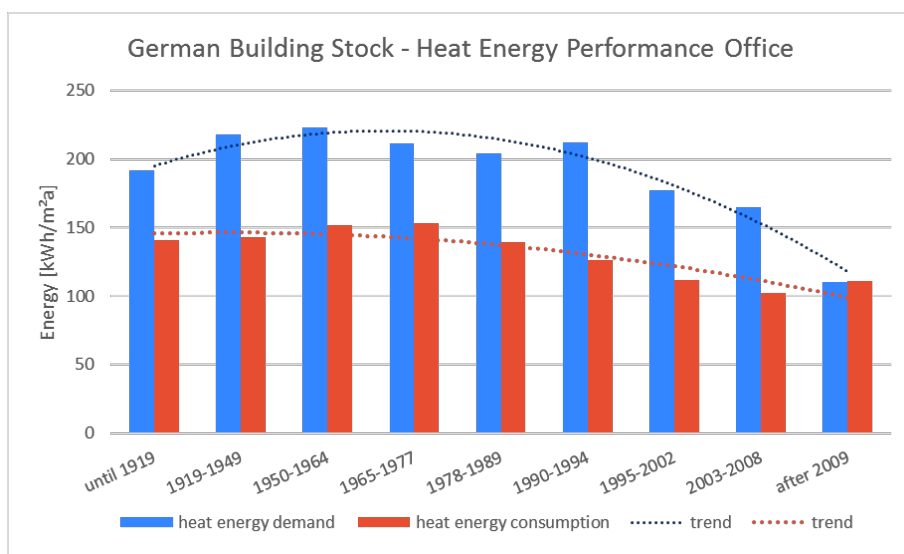


Figure 2: Heat Energy Performance of German Office Buildings (reference: dena)

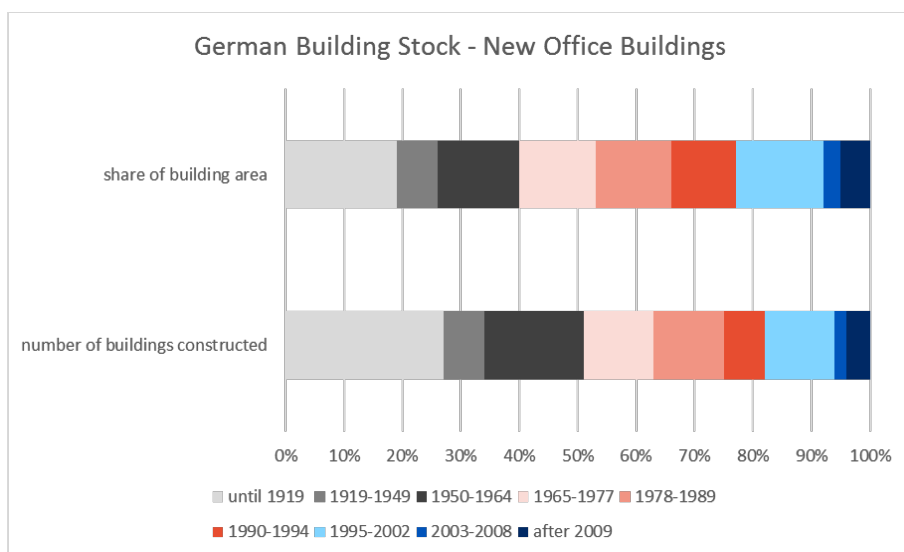


Figure 3: Number and Share of New Constructed German Office Buildings (reference: dena)

¹² Extrapolated using the ratio of heat to electricity without IT (dena study p. 18)

1.1.2 German Retail Building Selection

A data basis is also required for the German retail buildings in order to assess the carbon performance of the Top 15% of the local market. There is generally less energy data available for retail buildings due to the lower number of buildings and the much higher variance of actual use. In order to derive a correlation between building age class and energy efficiency as well as building age class distribution, two references are used for this building use: the study "Energy consumption of the trade, commerce and services (TCS) sector in Germany for the years 2007 to 2010"¹³ by Fraunhofer ISI for the BMWi (see Figure 4) provides information on the energy efficiency of retail buildings according to building age classes and the building age class distribution according to the dena study "Energy efficiency in retail"¹⁴ (see Figure 5). The focus in retail buildings is on non-food buildings, as the LBBW portfolio mainly comprises retail buildings with non-food uses.

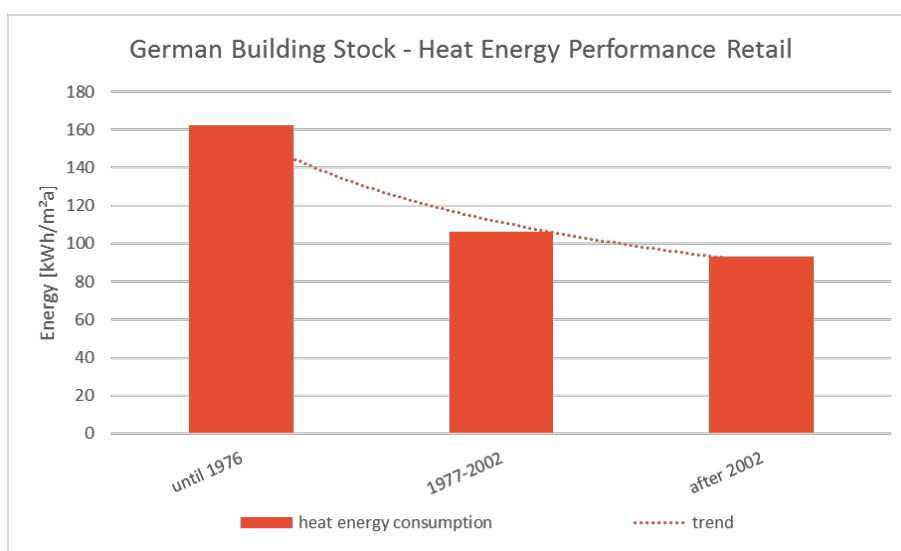


Figure 4: Heat Energy Performance of German Retail Buildings (reference: Fraunhofer ISI)

¹³http://www.isi.fraunhofer.de/isi-wAssets/docs/e/de/publikationen/GHD-Erhebung_Bericht_Energieverbrauch_2006-2010.pdf

¹⁴https://shop.dena.de/fileadmin/denashop/media/Downloads_Dateien/bau/9133_Energieeffizienz_im_Einzelhandel_Analyse_des_Gebaeudebestands_und_seiner.pdf

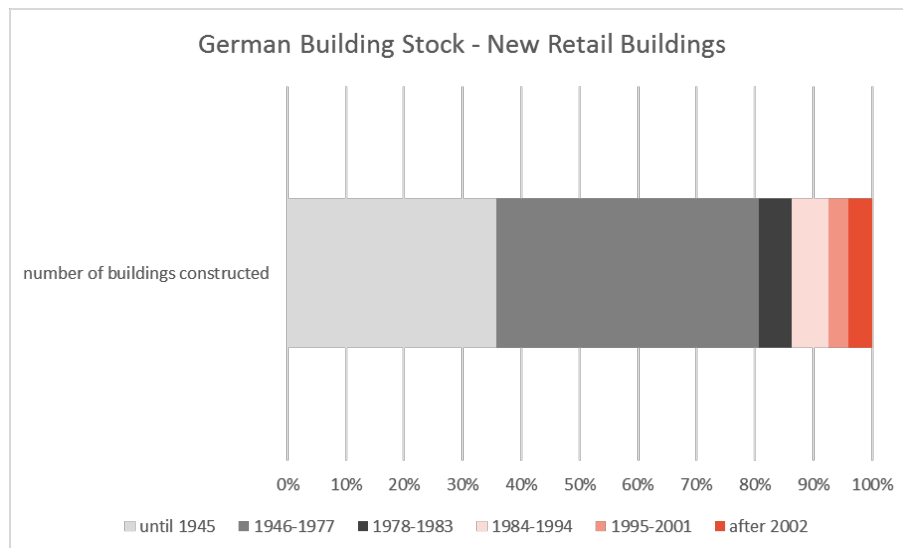


Figure 5: Number of New Constructed German Retail Buildings (reference: dena)

These two studies show that there is a correlation between building age class, energy efficiency and that the German retail buildings (non-food) constructed from 1983 to 1994 belong on average to the Top 15% of the local market. For the building age class 1983-1994, average specific energy consumptions for heat with 102 kWh/m²/a and electricity with 210 kWh/m²/a¹⁵ are given. In line with the assessment methodology for German office buildings, the conservative approach with EnEV 2007 is chosen here as well, i. e. all retail buildings built in 2007 and later are automatically among the Top 15 % of the local market. Compared to the aforementioned building age class 1983-1994, a safety buffer based on the consumption-related energy benchmarks is also created here, since the energy quality of the buildings has been improved and the retail buildings qualifying for the Green Bond are therefore most likely among the Top 15 % of the local market (and even significantly better than the Top 15%). As a conclusion, the building year is also a reliable criterion for the selection methodology of the Top 15 % of German retail buildings.

1.1.3 German Refurbished Building Selection

The building selection of the German office buildings under 1.1.1 and the German retail buildings under 1.1.2 refers exclusively to new buildings with the respective building year. The assessment methodology defined there does not cover the handling of major refurbished buildings how it

However, the EnEV as the German evaluation methodology for building energy efficiency contains the same procedure for the major refurbishment of buildings as for new buildings, only the target value is defined less sharply and in the previous EnEV versions allows the new building requirements to be exceeded by 40 %. This means that the energy de-

¹⁵ Extrapolated using the ratio of heat to electricity (dena study p. 49); in addition, these benchmarks are energy consumption values

mand of all buildings which have been undergone a major refurbishment since 2007 (independent of the building's use) is a maximum of 40% above the energy demand of a comparable new building.

Due to the conservative approach for the Top 15% of the buildings (office and retail), so that all new German Green Bond buildings have to comply with the EnEV 2007, the security buffer chosen in this way also allows for inclusion of the buildings (office and retail) which have been undergone a major refurbishment since 2007. As a result, the major refurbishment of buildings (office and retail) is also likely to be among the Top 15% of the local market from 2007 onwards. This also means that there is a simple yet reliable assessment methodology for the German major refurbished buildings (office and retail) based on the building year.

The property upgrade of climate bonds is firmly anchored in the CBI goals. Depending on the Green Bond term, carbon reduction targets are defined there, which can only be achieved by implementing energy efficiency measures or refurbishing buildings.

1.2 2nd Step – Future Building Selection

1.2.1 New Acquisition Buildings

The building portfolio financed by LBBW is constantly changing, i. e. financing arrangements are being phased out and new ones concluded. In order to be able to assign newly financed office buildings in Germany to the Green Bond in the future, and thus belong to the Top 15 % of the local market, the buildings must adhere to the following principle:

"The Green Bond can be directly extended by new constructed or existing office buildings with a site energy demand / energy consumption of $\leq 120 \text{ kWh/m}^2/\text{a!}$ "

This statement is also based on the dena study "Office properties - energy efficiency and incentives to increase energy efficiency"¹⁶ (see also Figure 2, after 2009).

1.2.2 Extended Building Selection of Existing LBBW Portfolio

Following the first issue of the Green Bond on the basis of the initial building selection, LBBW intends to successively expand the Green Bond volume.

To this end, the assessment methodology is to be supplemented to include the actual energy consumption measured. This should also make it possible to include other buildings in the LBBW portfolio with a construction or renovation year prior to 2007 in the Green Bond.

In contrast to the initial building selection with the evaluation of the theoretical energy performance, the energy efficiency of the actual building operation will be evaluated. Accuracy in the assessment of carbon performance based on energy consumptions will be also improved and this will create an incentive to implement energy optimization measures in building operations in order to improve the carbon impact of the Green Bond.

¹⁶https://shop.dena.de/fileadmin/denashop/media/Downloads_Dateien/bau/9196_Bueroimmobilien_Energetischer_Zustand_Anreize_Steigerung_Energieeffizienz.pdf

2 Selected Green Bond Portfolio Reporting

The source energy demand and CO₂ emissions are determined by multiplying the site energy demand by the source energy and CO₂ emission factors. The respective savings are calculated using the difference between the Top 15% benchmarks and the national building stock benchmarks. The absolute savings are shown in Figure 6 and the relative savings in Figure 7.

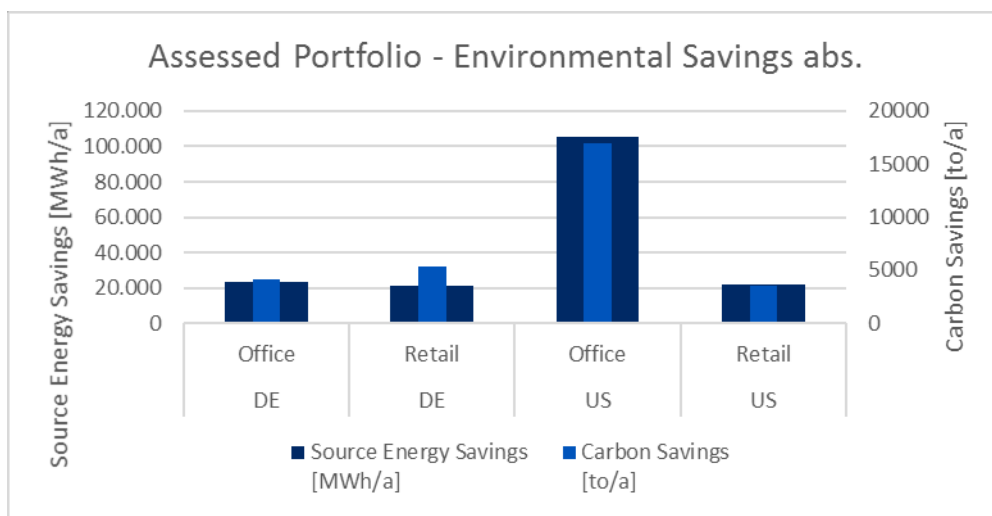


Figure 6: Absolute Environmental Savings of LBBW Green Bond Portfolio

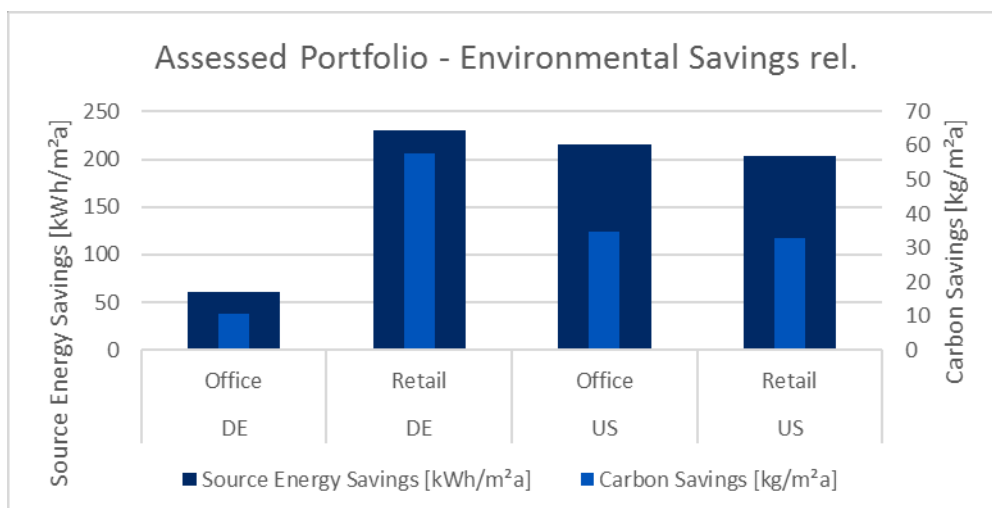


Figure 7: Relative Environmental Savings of LBBW Green Bond Portfolio

LBBW pre-selected the buildings from the overall portfolio. Based on these 70 buildings, the Green Bond assessment took place. 50 of the 70 buildings were selected for the Green Bond (see Figure 8). The assessed and selected building area is shown in Figure 9 with the respective country allocation.

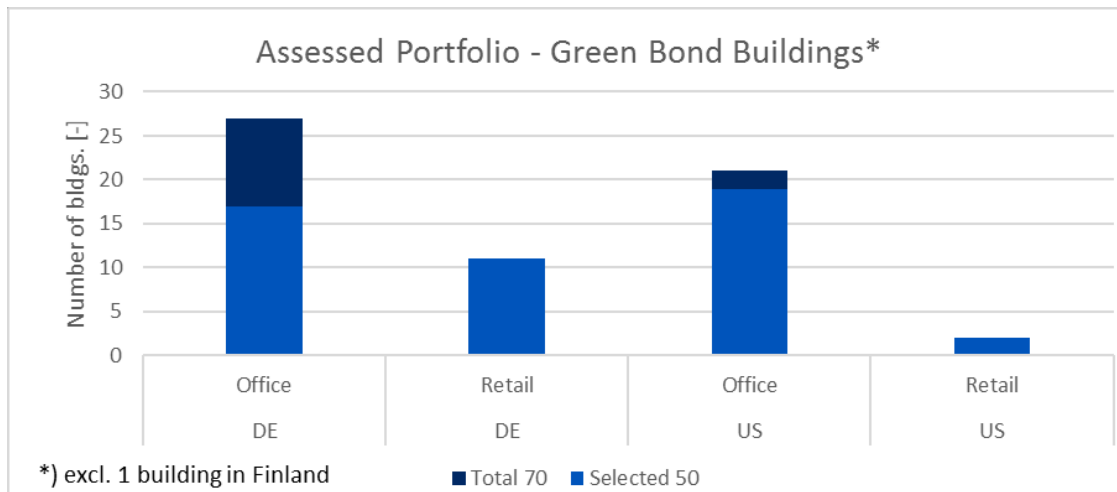


Figure 8: Size of LBBW Green Bond Portfolio (building use and country)

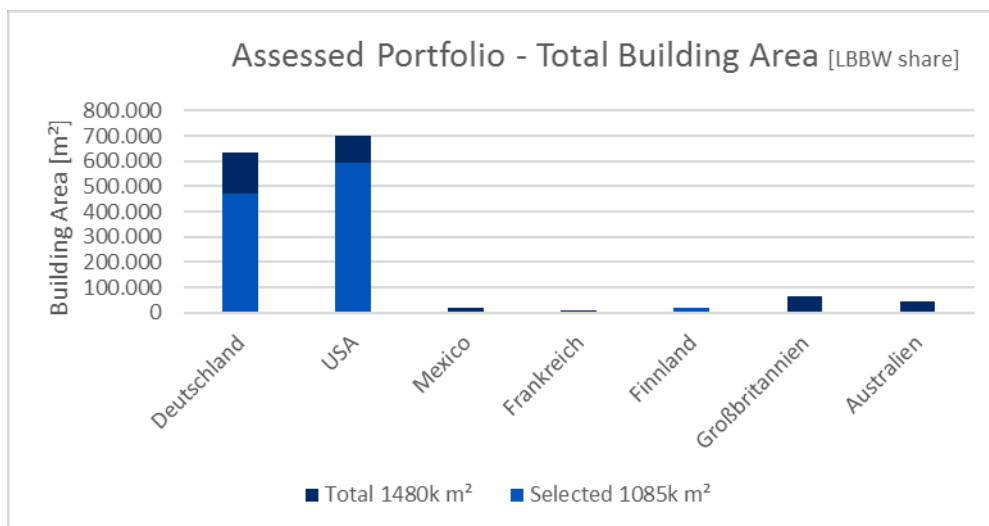


Figure 9: Size of LBBW Green Bond Portfolio (country)

The exposures of the rated and selected sub-portfolios are shown in Figure 11. The exposure allocation to the respective countries is shown in Figure 10.

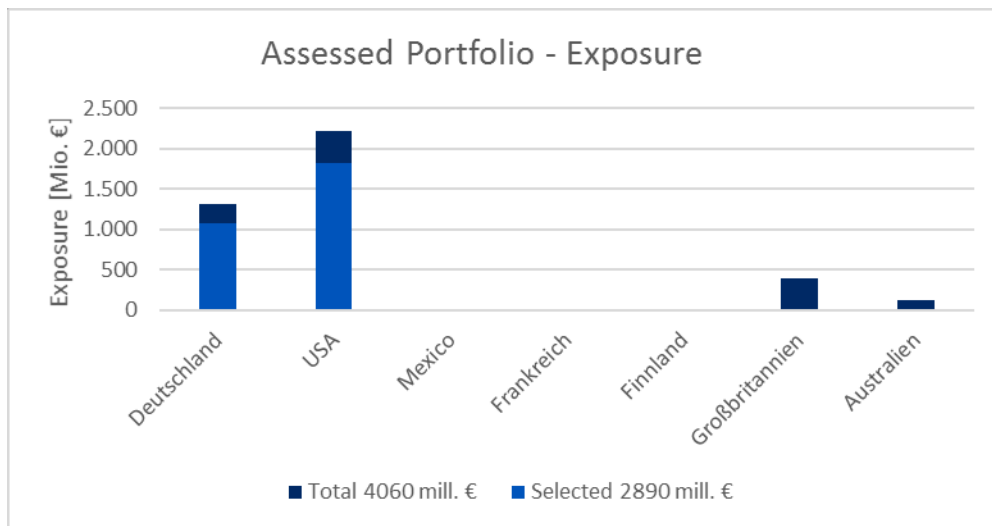


Figure 10: Volume of LBBW Green Bond Portfolio (country)

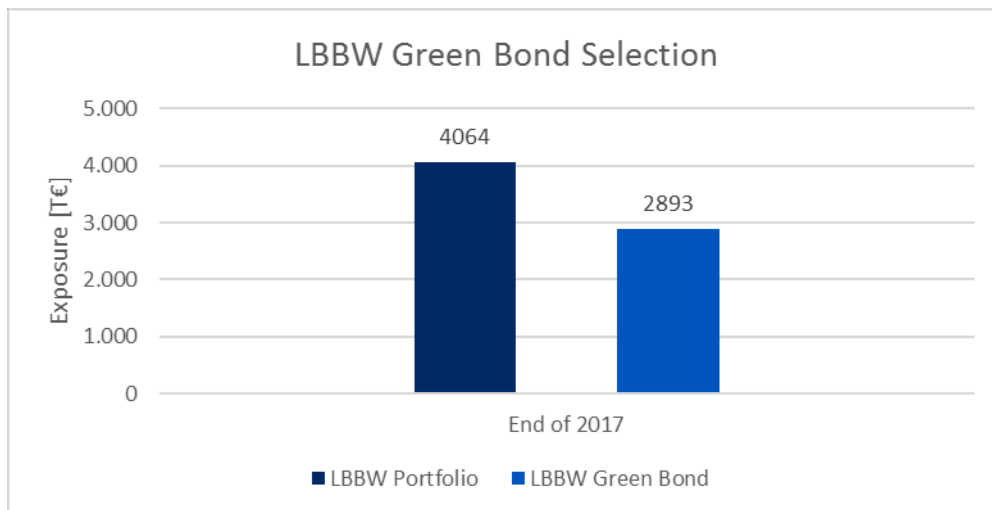


Figure 11: Volume of LBBW Portfolio (pre-selected and Green Bond-selected)

The Green Bond assessment of the buildings is carried out according to different assessment criteria, depending on the country and data situation. In this way, the selected buildings can be assigned to different subpools. Figure 12 shows the exposures divided into subpools, Figure 13 shows the number of buildings contained in each subpool.

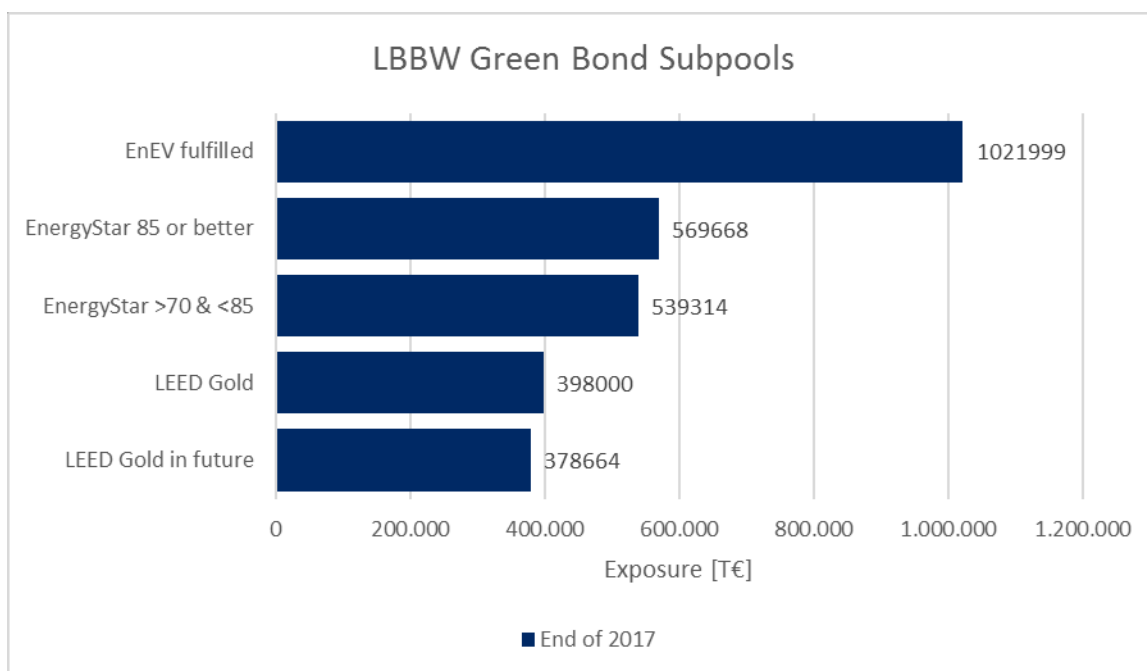


Figure 12: Volume of LBBW Green Bond Portfolio (subpools)

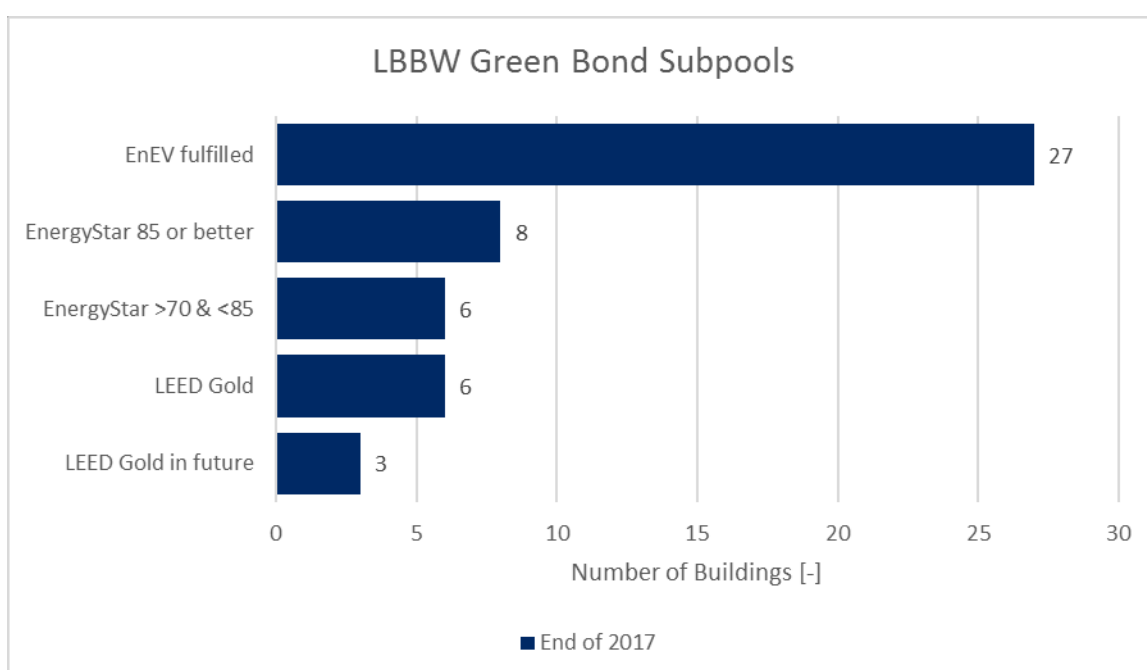


Figure 13: Number of Buildings LBBW Green Bond Portfolio (subpools)

An important parameter for bonds of any kind is the term. Since the Green Bond currently consists of 50 buildings, the remaining term of the buildings is shown clearly in Figure 14.

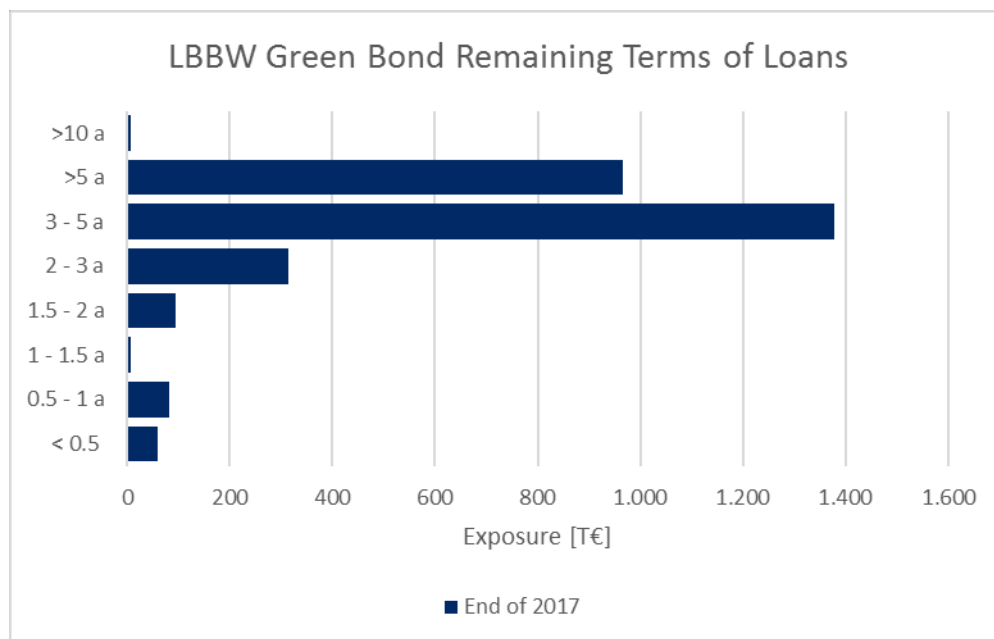


Figure 14: Remaining Terms of Loans für LBBW Green Bond Portfolio

3 Appendix – Calculation Examples

Building Data		[unit]	Reference
Name	Example Germany		
City	Hamburg		
Country	Germany		
Use	Office		
Size	15.000	m ²	
LBBW Syndicate Share	70	%	
LBBW Share Size	10.500	m ²	

Site Energy Benchmarks EUI		[unit]	Reference
National Building Stock	Heat	197 kWh/m ² /a	dena
	Electricity	43 kWh/m ² /a	dena
Top 15%	Heat	177 kWh/m ² /a	dena
	Electricity	39 kWh/m ² /a	dena

Source Energy Benchmarks EUI		[unit]	Reference
Source Energy Factors	Heat - Natural Gas	1,1	EnEV 2014
	Electricity	1,8	EnEV 2014
National Building Stock	Heat + Electricity	294 kWh/m ² /a	
Top 15%	Heat + Electricity	265 kWh/m ² /a	

Source Energy Top 15% Benchmark

$$= 177 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}} \times 1,1 + 39 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}} \times 1,8 = 265 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}}$$

Carbon Emission Benchmarks CEI			
CO ₂ Emission Factors	Heat - Natural Gas	202 gCO ₂ /kWh	GHG
	Electricity	486 gCO ₂ /kWh	IEA 2015
National Building Stock	Heat + Electricity	61 kgCO ₂ /m ² /a	
Top 15%	Heat + Electricity	55 kgCO ₂ /m ² /a	

Carbon Emission Top 15% Benchmark

$$= 177 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}} \times 202 \text{ gCO}_2/\text{kWh} + 39 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}} \times 486 \text{ gCO}_2/\text{kWh} = 55 \text{ kgCO}_2/\text{m}^2/\text{a}$$

Green Bond Impact Calculation		
Relative Source Energy Savings	Heat + Electricity	-29 kWh/m ² /a
Relative Carbon Reduction	Heat + Electricity	-6 kgCO ₂ /m ² /a
Relative Source Energy Savings = 265 kWh/m ² /a - 294 kWh/m ² /a = -29 kWh/m ² /a		
Relative Carbon Reduction = 55 kgCO ₂ /m ² /a - 61 kgCO ₂ /m ² /a = -6 kgCO ₂ /m ² /a		
LBBW Share Size		10.500 m ²
Absolute Source Energy Savings	Heat + Electricity	-307 MWh/a
Absolute Carbon Reduction	Heat + Electricity	-63 tCO ₂ /a
Absolute Source Energy Savings = -29 kWh/m ² /a x 10.500 m ² = -307 MWh/a		
Absolute Carbon Reduction = -6 kgCO ₂ /m ² /a x 10.500 m ² = -63 tCO ₂ /a		

Figure 15: Calculation example "office" for the Green Bond impact

Building Data		[unit]	Reference
Name	Example Germany		
City	Frankfurt		
Country	Germany		
Use	Retail		
Size	50.000 m ²		
LBBW Syndicate Share	100 %		
LBBW Share Size	50.000 m ²		

Site Energy Benchmarks EUI		[unit]	Reference
National Building Stock	Heat	151 kWh/m ² /a	BMWi
	Electricity	309 kWh/m ² /a	BMWi
Top 15%	Heat	102 kWh/m ² /a	BMWi
	Electricity	210 kWh/m ² /a	BMWi

Source Energy Benchmarks EUI		[unit]	Reference
Source Energy Factors	Heat - Natural Gas	1,1	EnEV 2014
	Electricity	1,8	EnEV 2014
National Building Stock	Heat + Electricity	722 kWh/m ² /a	
Top 15%	Heat + Electricity	491 kWh/m ² /a	

$$\text{Source Energy Top 15\% Benchmark} = 102 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}} \times 1,1 + 210 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}} \times 1,8 = 491 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}}$$

Carbon Emission Benchmarks CEI			
CO ₂ Emission Factors	Heat - Natural Gas	202 gCO ₂ /kWh	GHG
	Electricity	486 gCO ₂ /kWh	IEA 2015
National Building Stock	Heat + Electricity	181 kgCO ₂ /m ² /a	
Top 15%	Heat + Electricity	123 kgCO ₂ /m ² /a	

$$\text{Carbon Emission Top 15\% Benchmark} = 102 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}} \times 202 \text{ gCO}_2/\text{kWh} + 210 \frac{\text{kWh}}{\text{m}^2 \cdot \text{a}} \times 486 \text{ gCO}_2/\text{kWh} = 123 \text{ kgCO}_2/\text{m}^2/\text{a}$$

Green Bond Impact Calculation		
Relative Source Energy Savings	Heat + Electricity	-231 kWh/m ² /a
Relative Carbon Reduction	Heat + Electricity	-58 kgCO ₂ /m ² /a
Relative Source Energy Savings = 491 kWh/m ² /a - 722 kWh/m ² /a = -231 kWh/m ² /a		
Relative Carbon Reduction = 123 kgCO ₂ /m ² /a - 181 kgCO ₂ /m ² /a = -58 kgCO ₂ /m ² /a		
LBBW Share Size		50.000 m ²
Absolute Source Energy Savings	Heat + Electricity	-11.543 MWh/a
Absolute Carbon Reduction	Heat + Electricity	-2.888 tCO ₂ /a
Absolute Source Energy Savings = -231 kWh/m ² /a x 50.000 m ² = -11.543 MWh/a		
Absolute Carbon Reduction = -58 kgCO ₂ /m ² /a x 50.000 m ² = -2.888 tCO ₂ /a		

Figure 16: Calculation example "retail" for the Green Bond impact

This report covers 17 pages (incl. Cover Sheet and Table of Contents, *without* attachments).

Stuttgart, 2018-01-13

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