



**Annual Reporting
Green Bonds
2019/20**



Editorial



Dear Sir or Madam,

We are presenting the fifth edition of our Green Bond Annual Report at a time when the world has changed in numerous ways for all of us. People, markets and the economy are suffering from the worldwide spread of the coronavirus. Much of what we once considered certain is being questioned, and the way we organise and

process daily work is having to be adapted to this extraordinary situation. This also applies to Berlin Hyp.

For almost two months now, the majority of our employees have been working from home; currently, the figure is around 90 percent. In this process, we have discovered that far fewer business transactions and tasks require the presence of all employees on the premises than expected. This is also the case with our Green Bond Annual Report, which this time round was produced virtually "from home". Even if the current circumstances preclude joint celebrations, you will be able to read on the following pages that there is at least enough reason for our colleagues involved in Green Finance – and this now applies to the entirety of Berlin Hyp – to be proud of the developments of the past year:

→ In the reporting period from March 2019 to February 2020, we were able to increase the volume of our Green Finance portfolio by € 1,974 million, which is more than in any previous reporting period. We have thus exceeded our own demands and expectations.

→ Thanks to this strong acceleration, our strategic corporate goal of increasing the share of loans for green buildings to 20 percent of the total loan portfolio by the end of 2020 was achieved exactly one year earlier than planned. We would already like to present a follow-up goal to you today, but this clearly premature success means

that work on this is still in full swing. However, we are confident that we will soon be able to present you with a new, ambitious strategic climate goal of Berlin Hyp.

→ Together with other Pfandbrief banks, we succeeded in publishing minimum standards for Green Pfandbriefe at the level of the Association of German Pfandbrief Banks (vdp) last summer. This was a milestone in providing guidance to investors and future issuers and giving the market for Green Pfandbriefe a further boost.

→ Last year, for the third time in a row, we succeeded in launching two Green Bonds in benchmark format within one year. An 8-year Green Pfandbrief in July was followed by a 10-year senior preferred bond in October. With a re-offer spread of mid-swap –3 basis points, the Green Pfandbrief had the lowest risk premium of all covered bonds worldwide in 2019, but was nevertheless oversubscribed by more than three times and 59 percent of it was placed with foreign investors, which is also a new record. With now eight outstanding Green Bonds in benchmark format, Berlin Hyp remains the most active issuer from the group of European commercial banks.

→ Berlin Hyp's Green Bonds also received a number of awards in 2019. In June we received the award for the Best Asset-Based Green Bond from Environmental Finance. At the GlobalCapital Green Bond Awards in September, we were again awarded the Best Bank Issuer, the Best Green Covered Bond Issuer and the Best Post-Deal or Impact Reporting.

The latter we won for the third time in a row. This is a great incentive for us to present to you again this year an informative, detailed and transparent annual report.



As usual it comprises the following sections:

- A – Green Bond Framework** on page 4
- B – Portfolio Reporting** on page 6
- C – New Lending Reporting** on page 8
- D – Impact Reporting** on page 10

Of course, our reporting relates to the elapsed reporting period, but we do not want to rest on our successes; rather we want to continue to keep developing. In order to meet the formal requirements of the future EU Green Bond Standard now, we have already made appropriate adjustments to our Green Bond Framework.

In addition, we are further tightening our requirements for green buildings and reducing the maximum final energy demand for heat and electricity accepted by us in the office building class by 20 kWh per square metre per annum each. We consider this step to be important, especially in view of the emerging criteria for buildings under the EU taxonomy. At the same time, it serves our goal of offering you the best possible Green Bond product at all times, based on our core business of commercial real estate financing.

Your regular feedback shows us that we have succeeded in doing this well in the past. To ensure that this remains so in the future, your open feedback and diverse suggestions are still very important to us. Please stay in touch!

The coronavirus pandemic, its effects and how best to cope with it are currently challenging each of us in our own environment; nevertheless, it is still necessary to jointly continue the fight against climate change with unchanged, if not increased, strength.

I hope you enjoy reading this.

Yours sincerely,



Gero Bergmann





A Green Bond Framework

Together with this annual report, Berlin Hyp publishes the fourth update to its Green Bond Framework. In this context, two main adjustments have been made. In order to reflect its ambitious climate targets as good as possible in the framework the bank has decided to reduce the final energy demand threshold for heating and electricity of office buildings by 20 kWh/(m²a) each. In addition, a grace period of one year has been introduced for the case that an energy performance certificate (EPC) or a sustainability certification expires. Within this grace period, borrowers have the opportunity to submit a new proof of compliance with Berlin Hyp's eligibility criteria. If this is not provided or if the new EPC or the new sustainability certification does not meet the current criteria, the asset

is removed from the bank's Green Finance portfolio. The re-newed procedure is intended to give borrowers sufficient time to update the documentation and to reduce short-term fluctuations in the portfolio.

The revised framework as of April 2020 can be downloaded at www.berlinhyp.de/en/investors/green-bonds. The framework defines green buildings as energy-efficient commercial properties with an energy demand or consumption that does not exceed the following values:

Property type	Framework		
	Energy demand heating kWh/(m ² a)	Energy demand electricity kWh/(m ² a)	Total kWh/(m ² a)
Residential	60	–	60
Office	80	60	140
Retail	60	75	135
Hotels	95	60	155
Logistics (use: storage)	30	35	65
Light industrial (use: production)	105	65	170

Additional /alternative eligibility criteria include the following sustainability certificates ¹:

LEED	Gold status or higher
BREEAM	Very good status or higher
DGNB	Gold status or higher
HQE	High level status or higher

The reference values above form the basis of our criteria and are also part of the annual re-verification process by ISS-ESG. The criteria refer to the final energy demand. Alternatively, the primary energy demand value can be used in certain cases where modern technology has been installed in/at the building (such as a

block power station, heat recovery plant, etc.) to achieve a significant reduction in primary energy demand.

The eligibility criteria are generally to be fulfilled on an additive basis, which means that the main decision criterion is the sum of the energy demand for heating and electricity (shown in the above table in the "Total" column). In order to prevent buildings with energetically poor building envelopes or buildings with disproportionately high electricity demand from being included in the Green Finance portfolio, the maximum values in each energy demand category may not be exceeded by more than 20 percent. In the

¹ LEED, BREEAM, DGNB and HQE issue sustainability certificates for buildings. Buildings financed by Berlin Hyp following the issue of the Green Pfandbrief on 27 April 2015 must achieve a score of at least 50 percent in the energy efficiency category of the green building certificate if the building does not already qualify through its energy requirements and consumption.



case of residential buildings, the differences attributable to the personal characteristics of users mean that no maximum threshold for electricity consumption has been defined.

ISS-ESG positively assessed the sustainability of the green bond programme underpinning the issues as part of its second party opinion dated 22 August 2016. This verdict was confirmed in consideration of the adjustments to the framework as part of the annual re-verification process in April 2020.²



² The re-verification can be downloaded at www.berlinhyp.de/en/investors/green-bonds.



B Development of the Green Finance Portfolio

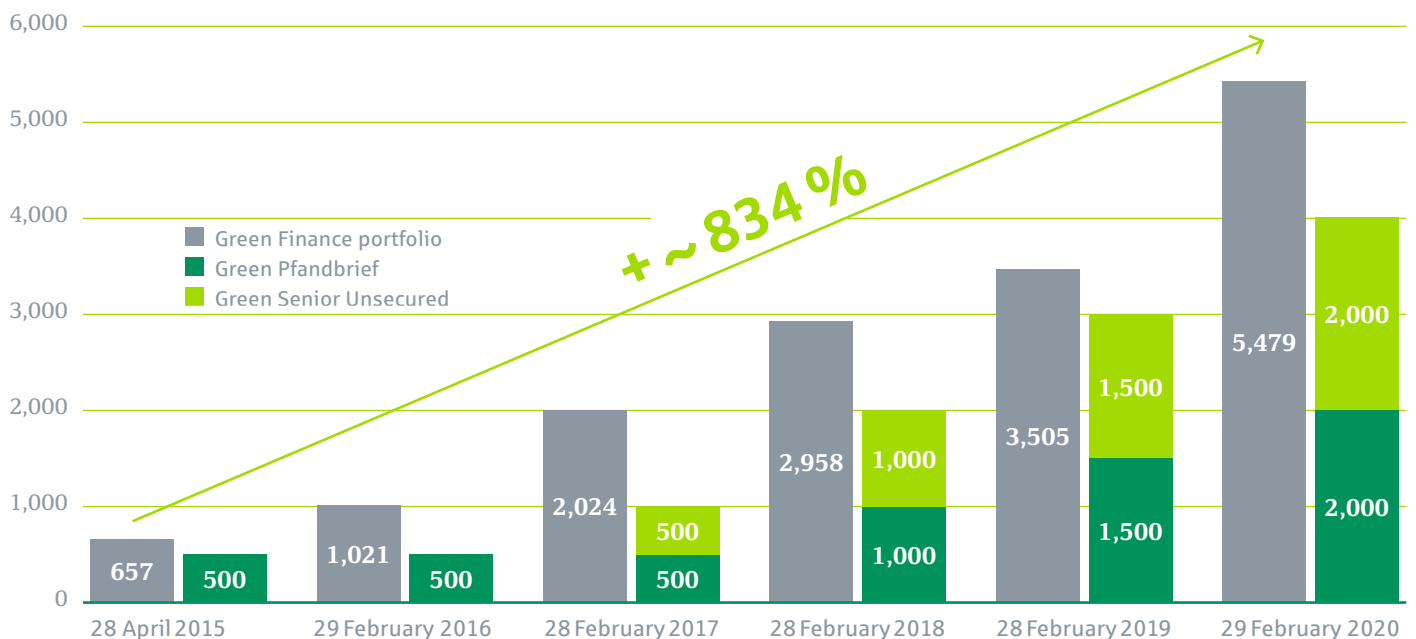
In the reporting period from 1 March 2019 to 29 February 2020, new green business of € 1,272 million (previous year € 489 million) was achieved. These are divided into € 930 million for loans for newly financed green buildings and € 342 million of newly granted loans for buildings already in the portfolio. The significant growth of 260 percent underlines the strategic importance of green finance for Berlin Hyp.

In addition, further loans with a total of € 702 million were identified retrospectively as eligible loans resulting in a € 1,974 million increase of the bank's Green Finance portfolio. The portfolio's total by 29 February 2020 stands at € 5,479 million. This equals, 21.84 percent of all the bank's financing

being green as at the reporting date, and it means that Berlin Hyp accomplished its strategic goal "20 percent of the loan portfolio consisting in loans for green buildings by the end of 2020" one year ahead of schedule. Both the real estate and the capital markets continue to show a growing interest in green finance, which should increase further as a result of the EU taxonomy.

As of 29 February 2020, the Green Finance portfolio encompassed the financing for a total of 180 properties. At € 2,970 million, around 52 percent of the portfolio is part of Berlin Hyp's mortgage cover pool. The overall development is shown in the following table and chart.

Nominal value € mn	Total	Number of green buildings
Total as at 28 February 2019	3,505	122
Extensions and retrospectively identified existing loans for green buildings less repayments	702	28
New loans for green buildings granted after 28 February 2019	1,272	30
Total as at 29 February 2020	5,479	180



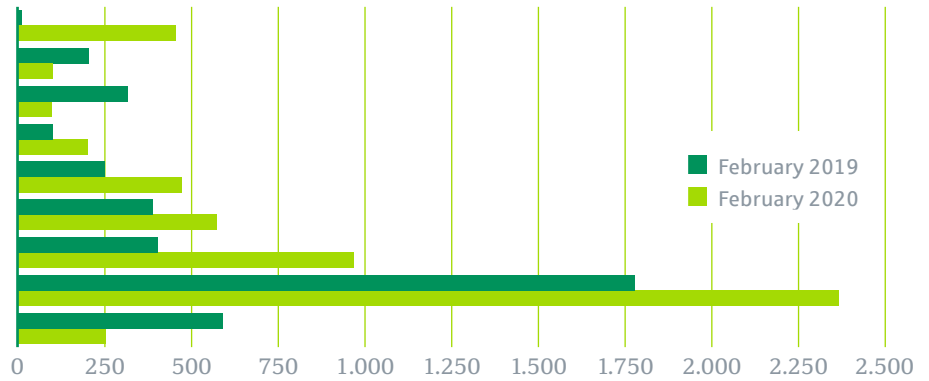
In sections B.1 to B.4, the green building financing included in Berlin Hyp's Green Finance portfolio is classified according

to a variety of parameters. All figures relate to the closing date as at 29 February 2020.



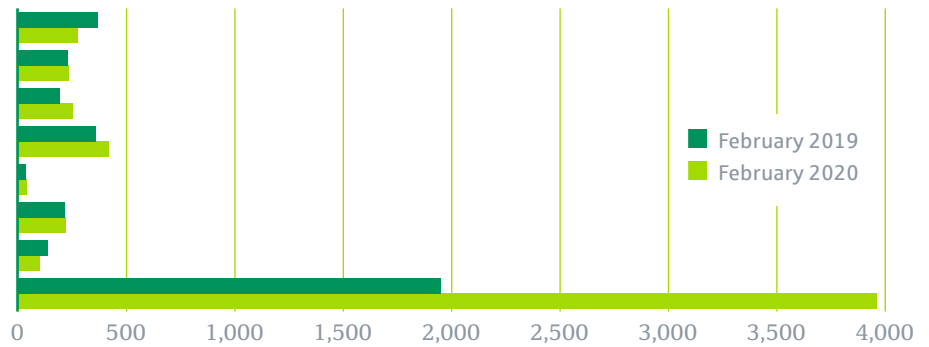
B.1 Loans for green buildings according to their term to maturity

Maturity structure	€ mn	%
≤ 6 months	455	8
6 months and ≤ 1 year	100	2
1 year and ≤ 1.5 years	97	2
1.5 and ≤ 2 years	201	4
2 and ≤ 3 years	470	9
3 and ≤ 4 years	571	10
4 and ≤ 5 years	968	18
5 and ≤ 10 years	2,365	42
> 10 years	252	5
Total	5,479	100



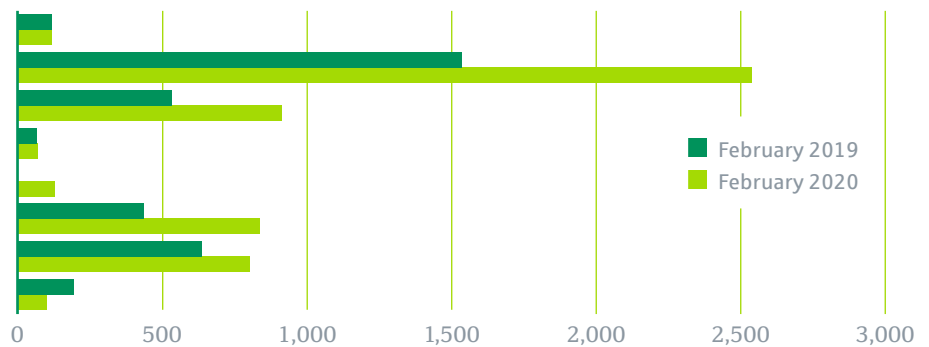
B.2 Loans for green buildings according to certification levels

Certificates	€ mn	%
BREEAM Excellent	274	11
BREEAM Very Good	230	6
DGNB Platin	250	5
DGNB Gold	418	10
HQE Basic Level	41	1
LEED Gold	219	6
LEED Platinum	100	4
EPC	3,947	57
Total	5,479	100



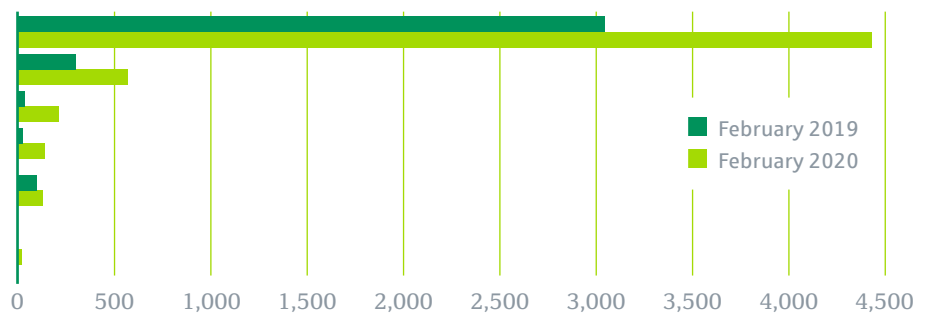
B.3 Loans for green buildings according to countries

Countries	€ mn	%
Belgium	115	2
Germany	2,534	46
France	909	17
UK	67	1
Luxembourg	125	2
Netherlands	834	15
Poland	798	15
Czech Republic	97	2
Total	5,479	100



B.4 Loans for green buildings according to type of use

Type of use	€ mn	%
Office buildings	4,416	81
Retail buildings	566	10
Logistic	210	4
Multi-family dwellings	139	3
Management/ Social buildings	129	2
Light industrial (use: production)	19	0
Total	5,479	100

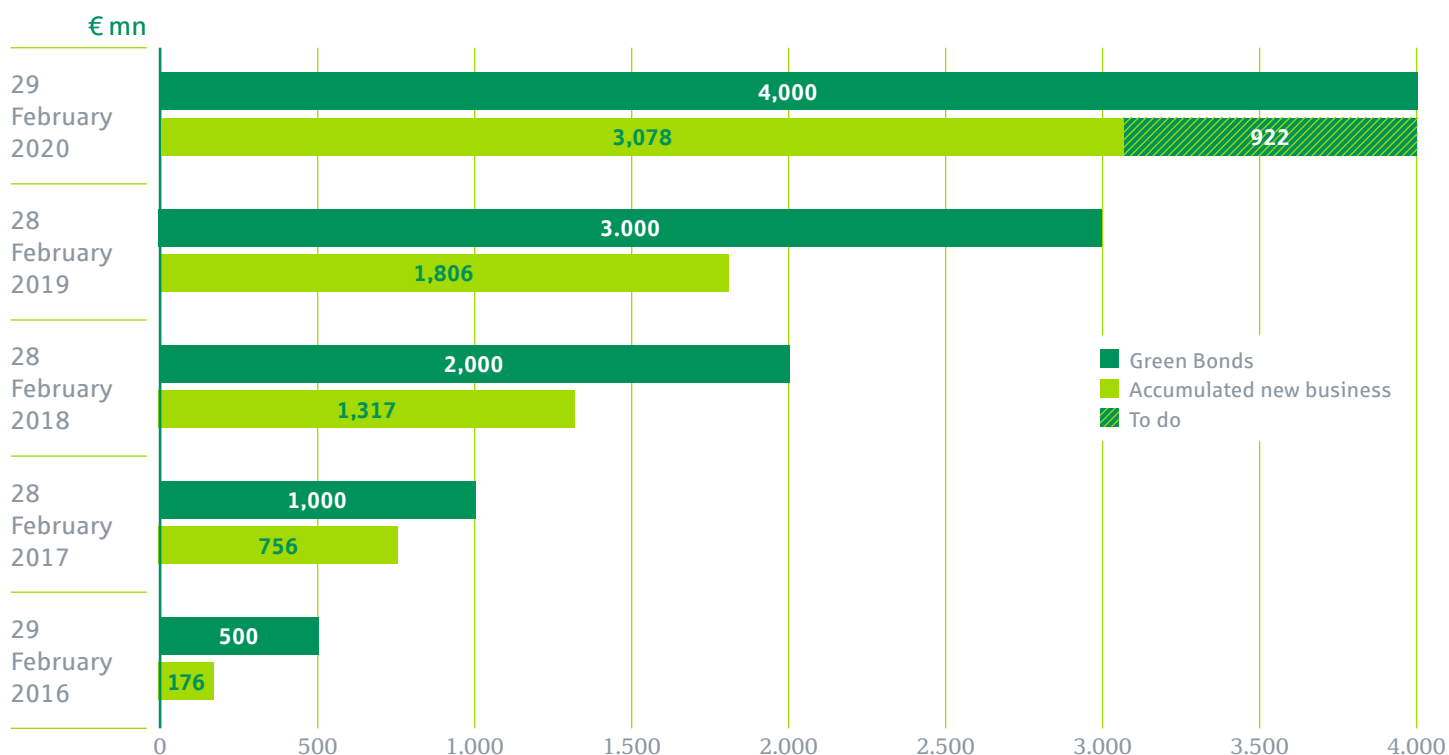




C New Lending Reporting

Since the issuance of the first Green Pfandbrief, the bank has pursued a best-effort approach and gives its commitment to do its utmost to invest an amount equivalent to the proceeds from the issued Green Bonds in new loans for green buildings during the terms of these bonds. During the reporting period Berlin Hyp issued two new Green Bonds, its fourth Green Pfandbrief (maturity 07/27) and its fourth green senior unsecured bond (maturity 11/29).

The chart below shows that € 3,078 million had already been invested in new loans for green buildings by 29 February 2020 in order to fulfil our commitment for the eight outstanding Green Bonds. Accordingly, a further € 922 million is necessary to meet the commitment for the two most recently issued bonds.



The new green buildings from the latest reporting period, along with energy demand figures and CO₂ savings, are presented below in anonymised form. For French properties, please note that the energy performance certificates do not differentiate between

heating and electricity. The total energy demand stated in the energy performance certificates has therefore been divided up among the two components in accordance with the ratios stipulated in our criteria.



New Buildings from 1 March 2019 till 29 February 2020

Type of use	Country	Granting of loan	Loan (€mn)	Certificate	Type of project	Rentable area (m ²)	Energy demand heating (kWh/m ² a)	Energy demand electricity (kWh/m ² a)	CO ₂ Savings vs. EnEV (kg CO ₂ /m ² a)
Retail	Germany	31.12.19	14.63	EPC	Financing	34,920	46	33	29
Office	Germany	23.12.19	14.08	EPC	Financing	27,218	114	40	27
Office	Germany	29.03.19	4.10	EPC	Financing	51,906	109	61	28
Retail	Germany	04.12.19	7.79	EPC	Financing	24,897	51	53	14
Office	France	30.04.19	0.13	BREEAM Excellent	Financing	16,968	–	–	–
Residential	Germany	27.02.20	5.29	EPC	Financing	4,907	45	–	5
Residential	Germany	30.09.19	25.97	EPC	Financing	12,637	66	–	–1
Office	Germany	10.02.20	10.96	DGNB Gold	Development	8,379	89	34	43
Office	Netherlands	07.06.19	29.91	EPC	Financing	10,954	75	27	40
Office	Poland	13.06.19	70.00	EPC	Financing	16,353	70	27	81
Office	Germany	08.08.19	9.70	EPC	Financing	3,805	26	38	49
Retail	Germany	11.09.19	5.50	EPC	Financing	4,335	17	11	48
Logistic	Germany	12.12.19	21.07	DGNB Gold	Financing	44,768	89	14	-3
Logistic	Germany	12.12.19	4.43	DGNB Gold	Financing	69,234	93	11	8
Office	Luxembourg	28.08.19	125.00	EPC	Financing	7,439	13	29	35
Office	Germany	02.08.19	27.25	EPC	Financing	8,357	48	52	32
Logistic	France	07.11.19	97.71	EPC	Financing	59,418	18	17	2
Logistic	France	07.11.19	50.34	EPC	Financing	57,748	17	16	2
Office	Poland	26.08.19	29.89	EPC	Financing	37,955	6	11	122
Office	Poland	26.08.19	12.18	EPC	Financing	19,299	72	56	41
Office	Poland	29.11.19	37.19	BREEAM Excellent	Financing	10,052	69	75	29
Office	Germany	11.11.19	37.40	EPC	Financing	25,500	103	58	15
Office	Germany	25.11.19	20.08	EPC	Financing	8,047	61	46	33
Office	Netherlands	13.02.20	28.75	EPC	Financing	16,607	43	30	42
Office	Germany	05.11.19	32.00	EPC	Financing	11,189	51	60	31
Residential	Germany	27.11.19	45.00	EPC	Financing	23,516	69	–	–2
Office	Germany	04.12.19	25.00	EPC	Financing	10,089	55	19	53
Office	Netherlands	19.12.19	11.10	EPC	Financing	7,731	–	26	52
Office	France	17.12.19	80.00	EPC	Financing	24,160	16	13	10
Office	Netherlands	18.12.19	48.00	EPC	Financing	20,786	74	39	35

930.44



D Impact Reporting: Results and Methodology

On the following pages, you will find the results and methodology of our assessment of avoided carbon emissions owing to Berlin Hyp's Green Bonds. The calculation of CO₂ savings is based on the energy demand for heating and the energy demand for electricity of green buildings.

In order to convert heating energy demand savings into avoided carbon emissions, individual conversion factors are applied based on the buildings' specific heating sources. In the case of green buildings in Germany heated by district heating system, there is also the possibility to account for regional differences. Factors applied for converting electricity energy demand savings into avoided carbon emissions are based on country-specific energy mixes.

The impact calculation was performed in partnership with the acclaimed consulting firm Drees & Sommer. The calculations were passed on to ISS-ESG on a line-by-line basis, who reviewed the plausibility of the results as part of a re-verification process in April 2020.³

All calculations are based on loan data as of 29 February 2020 and on the most current available EPC and/or sustainability certification for each property. If no EPC data is available, energy demands were set on equal levels with the baseline figures. This was the case for a total of 13 out of 180 buildings. If information regarding heating sources was not available (20 buildings), the country-specific CO₂ factor for district heating was used.

D.1 Estimated avoided carbon emissions

Several assumptions significantly influence the estimation of avoided carbon emissions.

First, the quantification of avoided carbon emissions of a specific asset depends on the choice of a baseline, i. e. the carbon emissions of a reference asset against which the carbon emissions of this specific asset are compared. This choice is highly sensitive, since avoided carbon emissions decrease as the energy efficiency of the chosen baseline increases. This is particularly true in the real estate sector, where buildings' energy performance varies greatly depending on asset type and construction year.

Second, another important decision is the way carbon emissions are allocated to one given asset. In practical terms, one can allocate the avoided carbon emissions of a given asset to the debt holder either in full or proportionally in the amount of the financing share.

In order to provide a maximum of transparency to investors, this carbon report includes four different estimates of avoided carbon emissions corresponding to two baselines:

→ The latest energy reference values (heating and electricity) for various real estate classes according to the German Energy Savings Regulation (Energieeinsparverordnung, EnEV, hereinafter referred to as "EnEV reference values").⁴ This reference provides an estimate of avoided carbon emissions.

³ Published on www.berlinhyp.de/en/investors/green-bonds

⁴ Joint Announcement by the Federal Ministry of Economics and Energy and the Federal Ministry for the Environment, Nature Conservation, Construction and Nuclear Safety (Ed.): Announcement of the Rules for Energy Consumption Values and the comparative values for non-residential buildings, 7 April 2015



→ Average heat energy efficiency of existing properties in Europe provides a second benchmark. This involves comparing each building with the average heat energy efficiency of existing properties in Europe. This baseline provides a rough estimate of the positive carbon impact of Berlin Hyp's Green Bond assets.

In addition, the following two assumptions are applied to the avoided carbon emissions:

- 100 percent of the carbon impact of each asset is allocated to Berlin Hyp financing.
- Carbon impact is allocated proportionally to Berlin Hyp's initial share in financing.

The results are provided in the table below.

In avoided tCO ₂ /€ mn/year	100 percent allocated to Berlin Hyp financing	Proportionally allocated to Berlin Hyp's initial financing share
against current EnEV reference values (heating energy and electricity)	39.89 (PY 38.81)	22.58 (PY 21.58)
against the European average (heating energy only)	24.77 (PY 22.20)	13.93 (PY 12.57)

The CO₂ savings per million euros invested have increased compared to the previous year. This is due to the improved energy efficiency of the Green Buildings in Berlin Hyp's Green Finance portfolio.

Comparison to EnEV reference values (heating and electricity)

Compared to EnEV reference values, annual savings of 408 GWh are achieved. 205 GWh out of these are based on heating energy savings.⁵ On average, financed green buildings have an energy demand for heating of 60 kWh/m²a, which is 49 percent lower than the weighted average EnEV reference values (118 kWh/m²a).⁵ In addition, a total of 203 GWh of electricity is saved every year. Financed green buildings have an average energy demand for electricity of 36 kWh/m²a, which is 61 percent lower than the weighted average EnEV reference values (93 kWh/m²a). **This results in avoided carbon emissions of 159,000 tonnes per year in absolute terms.**

Comparison to European average (heating only)

In terms of the European average, financed green buildings generate savings of 454 GWh concerning their energy demand for heating.⁶

The buildings have an average energy demand for heating of 60 kWh/m²a, which is 68 percent lower than the European average (188 kWh/m²a). This results in avoided carbon emissions of 99,000 tonnes per year in absolute terms.

⁵ The calculation of the average is based on buildings with available EPC data only (167 of 180).

⁶ $\sum [m^2 \text{ building} * (\text{baseline} - \text{kWh per m}^2)]$



D.2 Principles of methodology

The methodology is based on a two-phase process:

- I. **An estimation of the energy savings per building, which includes:**
 - a: **Assessment of each building's energy efficiency**
(Final energy demand for heating and for electricity in kWh/m² per year)
 - b: **Choice of the energy efficiency baseline**
EnEV reference values:
(Final energy demand for heating and for electricity in kWh/m² per year)
European average:
(Final energy demand for heating in kWh/m²a)
 - c: **Calculation of energy savings (a–b)**
EnEV reference values:
(Final energy demand for heating and for electricity savings in kWh/m²a)
European average:
(Final energy demand for heating savings in kWh/m²a)
- II. **An assessment of carbon intensity of avoided energy using specific carbon emissions factors through the following:**
 - d: **Assessment of the carbon intensity of different energy sources for heating and differentiation of carbon intensity of each country's electricity mix and district heating supply as well as further differentiation of the district heating supply in Germany by region**
(kg CO₂/kWh final energy demand)⁷
 - e: **Calculation of carbon intensity savings**
(*d) (kg CO₂/m² per year)
 - f: **Calculation of total avoided carbon emissions**
(e*rentable surface of the building)
(kg CO₂/m² per year)
 - g: **Initial Market Value of building**
(€ mn) (Initial Loan/Initial Loan to Value (LTV))
 - h: **Outstanding nominal amount in the Green Finance portfolio**
(€ mn)
 - i: **Berlin Hyp share expressed as a percentage of the initial market value of asset**
(Initial LTV) (%)
 - j: **Calculation of financed avoided carbon emissions**
(*i) (kg CO₂ per year)

⁷ See also Section D.4 and Appendix. A CO₂ factor of 0g/kWh is applied to buildings whose heating energy is produced by environmental energy. To calculate the savings, the local district heating factor is used as the benchmark value.



D.3 Energy efficiency baselines

Two sets of comparable values were selected as energy efficiency baselines in order to provide different annual estimates of energy savings:

Baseline 1: Current EnEV reference values

The energy savings calculated for the green buildings in Berlin Hyp's green finance portfolio are measured against the current standards in Germany using the reference values in the table below. As a result, energy-efficiency reference values for heating vary from 30 kWh/m²a for logistic buildings to 135 kWh/m²a for office buildings. Electricity standard values are between 35 kWh/m²a and 105 kWh/m²a.

The specific heating energy reference value for residential buildings is taken from the Deutsche Energie-Agentur Report on Buildings 2016. This value equates to the threshold value for new builds defined in the German Energy Savings Regulation 2016.⁸

Given that the framework for residential buildings does not take the energy demand for electricity into account, the electricity reference value for residential buildings is not included.

Use	Specific energy demand for heating (kWh/m ² a)	Specific energy demand for electricity (kWh/m ² a)
Residential	60	–
Office	135	105
Retail	70	85
Hotel	105	65
Logistics (use: storage)	30	35
Light industrial (use: production)	110	65

Baseline 2: Average energy efficiency of existing European buildings

Energy demand for heating, cooling and domestic hot water for buildings representative of existing building stock have been modelled in the European project ENTRANZE⁹. Single houses, multi-family dwellings, offices and schools are covered.

Comparing carbon emissions on the basis of energy demand for electricity is not suitable, as energy demands for ventilation and lighting are not taken into account as part of the project. Due to this fact, the baseline is only used to compare emissions caused by the energy demand for heating.

In accordance with the composition of Berlin Hyp's Green Finance portfolio, only the values for multi-family dwellings and offices are considered for the present calculation. Values for selected relevant countries/cities (Berlin, Vienna, Prague, Paris and Helsinki) are averaged to obtain a robust baseline.

As a result, 188 kWh/m²a is derived as a baseline of energy efficiency for European existing offices¹⁰ and 158 kWh/m²a is derived as a baseline of energy efficiency for existing European multi-family dwellings.

⁸ Deutsche Energie Agentur (publisher): dena Report on Buildings: Energy efficiency in the building stock – statistics and analyses (2016)

⁹ ENTRANZE, March 2014. Heating and cooling energy demand and loads for building types in different countries of the EU – D2.3. of WP2 of the Entranze Project. www.entranze.eu/files/downloads/D2_3/Heating_and_cooling_energy_demand_and_loads_for_building_types_in_different_countries_of_the_EU.pdf

¹⁰ This is assumed for all commercial real estate in Berlin Hyp for CO₂ reporting as ENTRANZE does not include any data for other commercial real estate except office buildings.



D.4 Carbon dioxide intensity of energy consumption in the real estate sector

97 out of the 180 Green Buildings are based in Germany, 32 in the Netherlands and 23 in Poland. In addition, three are situated in the Czech Republic, 21 in France and one in Belgium and the UK respectively. Furthermore, two are based in Luxembourg.

The following carbon emissions factors split into respective energy sources originate from the standard reference work of the European Commission¹¹ and have been included in the calculation for all countries.

Energy source	kg CO ₂ /kWh final energy demand
Heating oil	0.306
Natural gas	0.240
Liquefied gas	0.281
Wood	0.420
Biogas	0.284
Biopetroleum	0.182



¹¹ Joint Research Centre of the European Commission (Hrsg.): „CoM Default Emission Factors for the Member States of the European Union“, <http://data.jrc.ec.europa.eu/dataset/jrc-com-ef-comw-ef-2017>



The emission factor for environmental energy is 0 kg CO₂/kWh final energy demand and is taken from DIN V 18599.

The following emissions factors were able to be used, with the help of information provided by regional energy supply companies, for a detailed calculation of emissions from district heating systems in Germany:

District heating by region in Germany	kg CO ₂ /kWh final energy demand
Munich	0.125
Cologne	0.074
Duisburg	0.126
Frankfurt am Main	0.175
Düsseldorf	0.078
Böblingen	0.089
Offenbach am Main	0.317
Oberhausen	0.080
Mannheim	0.182
Bonn	0.141
Neubrandenburg	0.194
Essen	0.178
Hamburg	0.146
Dortmund	0.200
Karlsruhe	0.077
Saarbrücken	0.123
Berlin	0.129
Burgkirchen an der Alz	0.196
Stuttgart	0.196
Wolfsburg	0.214
Leipzig	0.224
Dresden	0.546
Hanau	0.232
Dessau	0.141
Halle	0.212
Mainz	0.092
Bremen	0.167



Carbon emissions factors for district heating systems outside of Germany were calculated as no complete data was available. The method used to calculate these values is described in the Appendix.

District heating by country	kg CO ₂ /kWh final energy demand
France	0.039
Netherlands	0.195
Poland	0.364
Czech Republic	0.313
Belgium	0.074
UK	0.112

The following country-specific emissions factors¹² were used to calculate emissions from energy demand for electricity:

Electricity by country	kg CO ₂ /kWh final energy demand
France	0.093
Netherlands	0.486
Poland	1.090
Czech Republic	0.850
Belgium	0.589
UK	0.239
Luxembourg	0.108

The emissions factor for electricity in Germany is 0.550 kg CO₂/kWh final energy demand and is taken from the DIN V 18599 standard.¹³

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¹² Joint Research Centre of the European Commission (Hrsg.): „CoM Default Emission Factors for the Member States of the European Union“, <http://data.jrc.ec.europa.eu/dataset/jrc-com-ef-comw-ef-2017>

¹³ DIN Deutsches Institut für Normung e.V.: DIN V 18599-1:2018-09 Energy performance of buildings – Calculation of useful, final and primary energy requirements for heating, cooling, ventilation, domestic hot water and lighting – Part 1: General balancing methods, definitions, zoning and evaluation of energy sources (2018)



Appendix

In order to calculate carbon emissions from district heating systems in buildings outside of Germany, the emissions factor must either already be known or, as in this case, be determined.

Country-specific data relating to heating energy and electricity production, as well as total carbon emissions in the year 2017¹⁴ as published by the International Energy Agency, are used to determine the emissions factor.

Country	Heat energy produced ¹⁵ (TWh)	Electricity produced ¹⁵ (TWh)	Total emissions ¹⁶ (MtCO ₂)
France	42.72	436.86	45.8
Netherlands	24.59	105.65	57.9
Poland	67.65	135.79	151.6
Czech Republic	24.80	57.34	53.9
Belgium	4.84	81.92	15.9
UK	15.43	300.68	88.0

Given that carbon emissions are calculated as the total of emissions out of electricity and heating, the values only attributable

to heating energy must be determined for each country first of all as follows:

$$\text{CO}_2 - \text{emissions (heat)} = \text{percentage of heat emissions} * \text{CO}_2 - \text{emissions}_{\text{tot}}$$

The percentage share of heating energy emissions compared to total emissions equates to the percentage share of heating energy generated compared to overall energy generated in consideration of energy production efficiency.

This is calculated on the basis of existing energy data.

Using these heating energy emissions values, the emission factor can now be calculated in relation to the heating energy generated by the respective country:

$$\text{CO}_2 - \text{emission factor (heat)} = \frac{\text{CO}_2 - \text{emissions (heat)}}{\text{heat output}}$$

This provides the following emissions factors for district heating outside of

Germany, which are essential for the Impact Report:

District heating by country	kg CO ₂ /kWh final energy demand
France	0.039
Netherlands	0.195
Poland	0.364
Czech Republic	0.313
Belgium	0.074
UK	0.112

¹⁴ More recent data is not available.

¹⁵ Headline Energy Data 2019. https://iea.blob.core.windows.net/assets/fffa1b7d-b0c5-4e64-86aa-5c9421832d73/IEA_HeadlineEnergyData.xlsx

¹⁶ IEA, 2019, Fuel Combustion Highlights – Carbon Content Values (kg C/GJ). https://iea.blob.core.windows.net/assets/eb3b2e8d-28e0-47fd-a8ba-160f7ed42bc3/CO2_Emissions_from_Fuel_Combustion_2019_Highlights.pdf



**Never underestimate
the power
of your impact!**

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