ING DiBa Green Bond

Methodology Report

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1 Summary

The developed certification methodology enables ING-DiBa to evaluate their residential building asset portfolio to initiate a green bond based on the eligible green project category “green buildings”.

The methodology approach of relative stringency of energy labels and rating tools identifies Germany’s Top 15 % best residential buildings to be eligible for a Green Bond, if their energy performance is rated with a certificate of class B or better or if their technical condition is in accordance with EnEV 2009 or newer (e.g. EnEV 2014, EnEV 2016, GEG 2020) based on the year of construction. Alternatively, a major renovation with a resulting improvement in carbon emissions by at least 30 % (depending on the bond duration) against a business-as-usual-scenario, can also achieve eligibility for a green bond. To evaluate the assets regarding green building certifications or energy performance-related criteria like a linear carbon trajectory approach has proven not feasible due to a lack of relevant data.

The green bonds assets’ final energy savings and avoided greenhouse gases’ carbon emissions are benchmarked against Germany’s national mean final energy demand and carbon emissions intensity:

– Residential: 147 kWh/m²yr & 0.232 $kgCO_2$/kWh

For a continuous impact reporting, the asset’s energetic and carbon performance can be tracked with a spreadsheet applying ING-DiBa’s green bond methodology. The spreadsheet verifies the asset’s eligibility for ING-DiBa’s green bond and determines the associated final energy savings and avoided carbon emissions. Future possible assets can be added and will be evaluated automatically.

ING-DiBa’s asset portfolio has been evaluated based on the proposed green bond methodology covering a bond issuance from 31.08.2021 with a duration of ten years until 31.08.2031:

Low Carbon Buildings	Date of Issuance	Type	Signed Amount[a]	Share of Total Portfolio Financing[b]	Eligibility for green bonds[c]	Average portfolio lifetime[d]	Annual final energy savings[e]	Annual CO2 emissions avoidance[f]
Unit	*[dd.mm.yyyy]*	*[-]*	*[EUR]*	*[%]*	*[%]*	*[years]*	*[MWh/year]*	*[tCO2/year]*
ING-DiBa AG Green Bond	*31.08.2021*	*Low Carbon Building*	*2,891,142,225*	*100.0*	*100*	*9.6*	*165,093*	*38,302*
Einfamilienhaus (freistehend)	31.08.2021	Low Carbon Building	1,601,784,732	55.4	100	10.0	102,948	23,884
Zweifamilienhaus	31.08.2021	Low Carbon Building	41,467,676	1.4	100	6.8	3,536	820
Reihenhaus	31.08.2021	Low Carbon Building	249,487,116	8.6	100	7.2	14,712	3,413
Eigentumswohnung	31.08.2021	Low Carbon Building	630,888,297	21.8	100	9.1	23,142	5,369
Doppelhaushälfte	31.08.2021	Low Carbon Building	367,514,404	12.7	100	10.4	20,756	4,815

[a] Legally committed signed amount by the issuer for the porfolio or portfolio components eligible for green bond financing.
[b] Portion of the total portfolio cost that is financed by the issuer.
[c] Portion of the total portfolio cost that is eligible for Green Bond.
[d] average remaining term of Green Bond loan within the total portfolio.
[e] Final energy savings calculated using the difference between the top 15% and the national building stock benchmarks
[f] Greenhouse gas emissions avoidance determined by multiplying the final energy savings with the carbon emissions intensity

2 Intent

ING-DiBa AG (ING-DiBa) wants to initiate a Green Bond for its residential building portfolio in Germany.

Drees & Sommer SE provide consulting services to develop a methodology in compliance with the Climate Bond Initiative's (CBI) "Residential Property Climate Bonds – Low Carbon Buildings" and the corresponding criteria and methods for ING-DiBas' Green Bond.

ING-DiBas' selected residential building portfolio is assessed and evaluated by DS SE to set up a technical reporting system. Implementing an impact reporting based on the developed methodology for the Green Bond finalizes the consulting services.

3 Climate Bonds Initiative

The Climate Bonds Initiative – CBI is an international organization which engages investors and projects to develop a market "Green and Climate Bonds"[1] for climate change solutions.

3.1 Standard & Certification Scheme

CBI provides standards & certification schemes for different sectors:

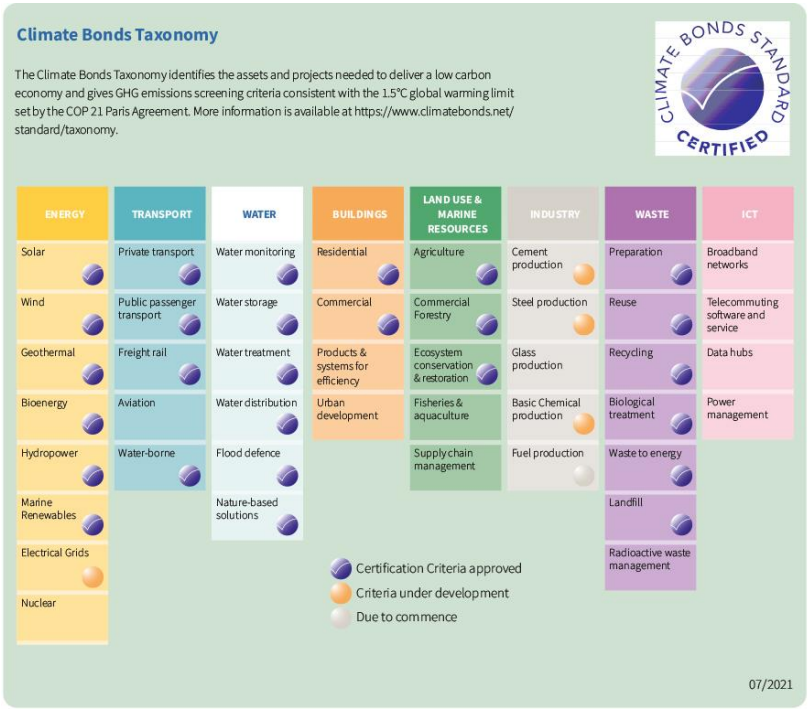


Figure 3-1: Climate Bonds Taxonomy: Sector criteria development – CBI[2]

For ING-DiBa's asset portfolio, the applicable sector for its green bond is the "low carbon buildings" representing residential buildings.

To show compliance and eligibility for a green bond, the Climate Bonds Initiative provides several pathways (illustrated in Figure 3-2) for low carbon buildings based on the availability of information and sufficient data quality.

[1] Climate Bonds Initiative. https://www.climatebonds.net/about

[2] Climate Bonds Initiative – CBI. Taxonomy Climate Bonds Taxonomy | Climate Bonds Initiative - July 2021

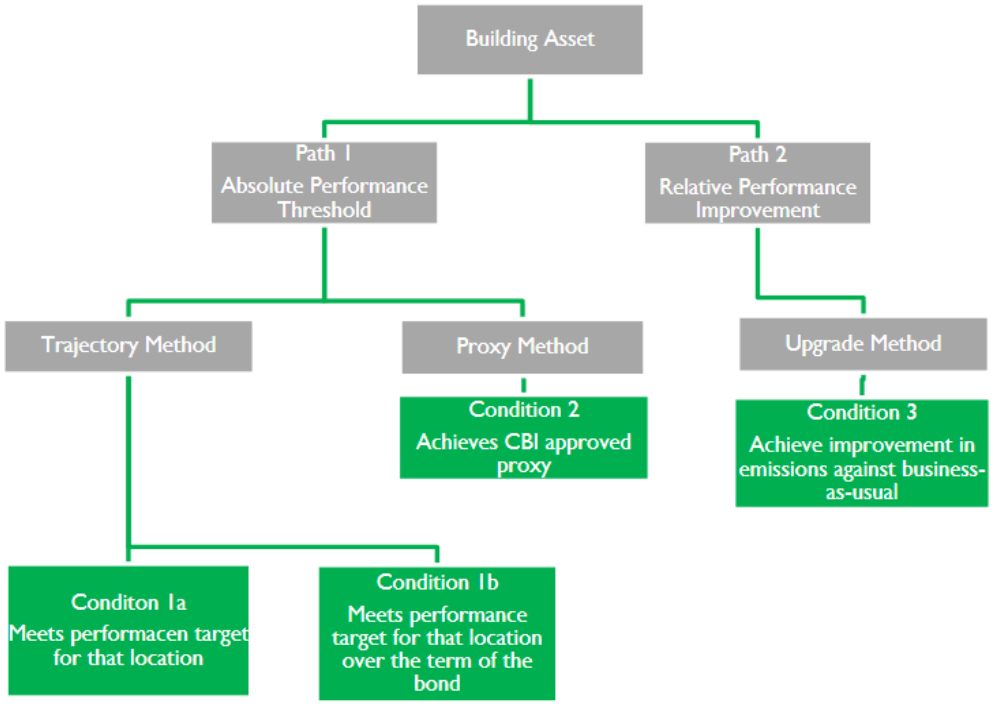


Figure 3-2: Certification pathways for bond issuers[2]

Furthermore, CBI offers detailed guidance on the possible certification methodology for either residential-, commercial buildings, or upgrade projects.

3.2 Residential Property

Climate Bonds Initiative's certification methodology for residential property climate bonds provides two methods in the latest Version of July 2020[3] from the low carbon buildings technical working group to fulfill compliance:

- Method 1: Benchmarking against local market carbon performance
- Method 2: Relative stringency of energy labels and rating tools

The level of data information and quality determines, which method is more suitable to be used to show compliance for the green bond.

[3] The Buildings Criteria for the Climate Bonds Standard & Certification Scheme. https://www.climatebonds.net/files/files/standards/Buildings/Low%20Carbon%20Building%20Criteria_V_1_1_July2020.pdf

3.3 Property Upgrade

Climate Bonds Initiative's certification methodology for property upgrade includes assets which undergo or have undergone one of the following:

- major renovation,
- refurbishment,
- retrofit,
- thermo-modernization,
- or energy efficiency upgrade.

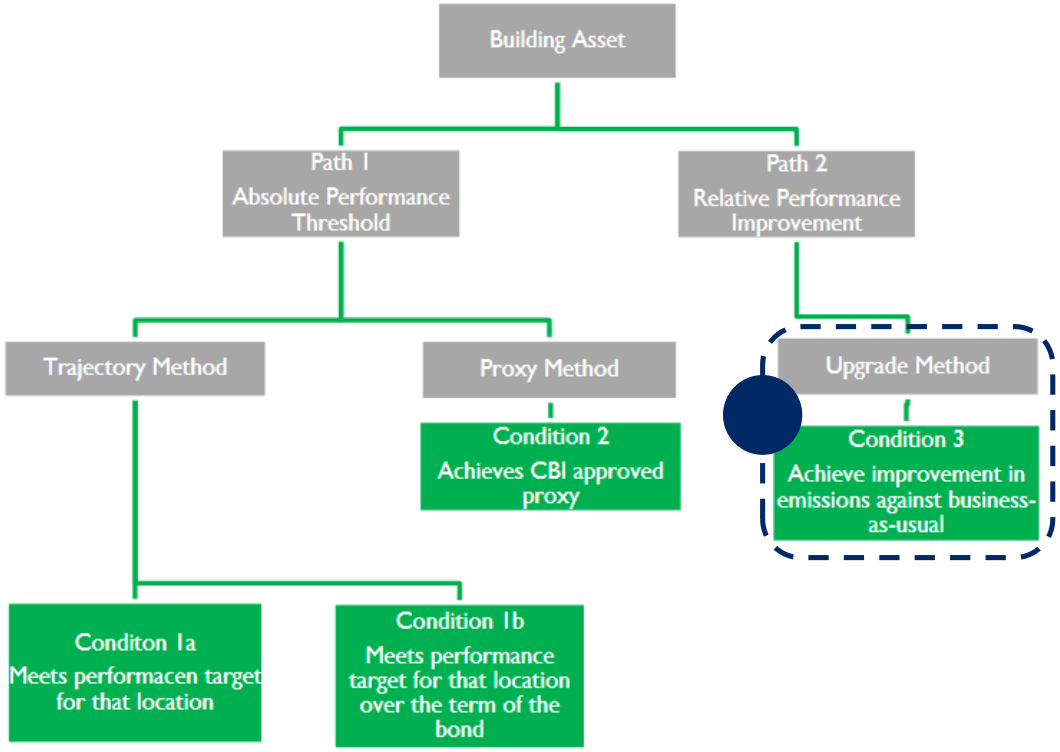


Figure 3-3: Climate Bonds Initiative's pathway to asset evaluation and certification[4]

Following the upgrade method, assets do require improvements, which result in reductions of at least 30 % or more in carbon emissions based on the green bond date of issuance and duration of the term.

[4] Climate Bonds Initiative. Low Carbon Building Criteria. The Buildings Criteria for the Climate Bonds Standard & Certification Scheme. September 2018. https://www.climatebonds.net/files/files/low%20carbon%20building%20criteria.pdf

4 Literature Review

4.1 German Residential Building Stock

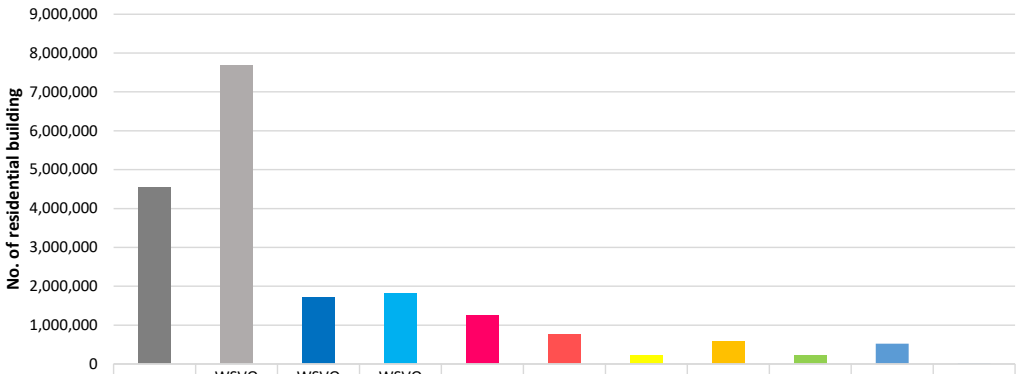
The main information sources for this literature review are governmental institutions such as the "Central Statistical Office (Statistisches Bundesamt Destatis[5])", "Census 2011[6]" & "micro census 2014[7]", as well as commercial institutions e. g. "Deutsche Energie-Agentur (DENA)[8]", "Buildings Performance Institute Europe[9]" including European-wide programs and metrics as the "National Energy Efficiency Action Plan[10]", "TABULA[11]" and the EU building stock observations[12].

In Germany, there are by the end of 2020 approximately 19.3 million residential buildings[5] and 41.4 million residential dwellings[5].

Figure 4-1 shows a breakdown of residential German buildings clustered into several groups of year of construction periods over time and the correlating amount of buildings. Data from 1995 - 2020 is based on Destatis[5]. Data from before 1995 is added from Census 2011[6] and Microcensus 2014[7].

The number of buildings, which have undergone an energy efficient retrofit, are not included.

[5] DESTATIS. Statistisches Bundesamt. https://www.destatis.de/DE/Home/_inhalt.html.
[6] ZENSUS2011. https://www.zensus2011.de/DE/Home/home_node.html
[7] Mikrozensus – Zusatzerhebung 2014. Bestand und Struktur der Wohneinheiten. Wohnsituation der Haushalte 2014.Statistsches Bundesamt, Wiesbaden 2016.
[8] Deutsche Energie-Agentur (DENA). dena-Gebäudereport 2021. Fokusthemen zum Klimaschutz im Gebäudebereich. dena-LEITFADEN: Energiespar-Contracting (ESC) – Arbeitshilfe für die Vorbereitung und Durchführung von Energiespar-Contracting
[9] Buildings Performance Institute Europe (BPIE). http://bpie.eu/national-initiatives/germany/.
[10] Federal Ministry for Economic Affairs and Energy . Bundesministerium für Wirtschaft und Energie (BMWi). National Energy Efficiency Action Plan (NEEAP) 2017 for the Federal Republic of Germany.. https://ec.europa.eu/energy/sites/ener/files/documents/de_neeap_2017_en.pdf
[11] Institut für Wohnen und Umwelt (IWU). Typology Approach for Building Stock Energy Assessment (TABULA). http://episcope.eu/building-typology/country/de/.
[12] EU Building Stock Observatory. https://data.europa.eu/euodp/de/data/dataset/building-stock-observatory



	- 1945	WSVO 1977	WSVO 1984	WSVO 1995	EnEV 2002	EnEV 2004	EnEV 2007	EnEV 2009	EnEV 2014	EnEV 2016	GEG 2020
Buildings	4,540,949	7,669,556	1,698,386	1,823,531	1,245,240	764,751	207,390	571,460	210,650	522,655	18,718
Share	23.6%	39.8%	8.8%	9.5%	6.5%	4.0%	1.1%	3.0%	1.1%	2.7%	0.1%

Figure 4-1: Residential building stock in Germany[5-7], with updated data until End of 2020

Figure 4-1 shows a breakdown of residential German buildings clustered into several groups of year of construction periods over time and the correlating amount of buildings.

4.2 Residential Energy Performance Building Codes in Germany

Over the years, several buildings codes in Germany exist targeting the energy performance of residential and non-residential buildings. The following table gives an overview about the applicable energy efficiency codes and standards:

Table 4-1: German building codes and standards targeting building energy performance

Name	Abbreviation	Year
Wärmeschutzverordnung 1977	WSVO 1977	1977-1983
Wärmeschutzverordnung 1984	WSVO 1984	1984-1994
Wärmeschutzverordnung 1995	WSVO 1995	1995-2001
Energieeinsparverordnung 2002	EnEV 2002	2002-2003
Energieeinsparverordnung 2004	EnEV 2004	2004-2006
Energieeinsparverordnung 2007	EnEV 2007	2007-2008
Energieeinsparverordnung 2009	EnEV 2009	2009-2013
Energieeinsparverordnung 2014	EnEV 2014	2014-2015
Energieeinsparverordnung 2016	EnEV 2016	2016-2020
Niedrigstenergiestandard GEG	GEG	November 2020

Germany's building energy performance requirements contain limits and requirements for (not limited to):

- Non-renewable primary and final energy demand for heating, ventilation, cooling and domestic hot water in kWh/(m²yr)
- Building constructions' heat transfer coefficient (walls, roofs, ceilings, windows)
- Minimum thermal insulation thickness for distribution pipes and components
- Additional requirements

The non-renewable primary and final energy demand for installed lighting systems is excluded from the scope for residential buildings, based on §3 of GEG 2020[13].

[13] Gesetz zur Einsparung von Energie und zur Nutzung erneuerbarer Energien zur Wärme- und Kälteerzeugung in Gebäuden (Gebäudeenergiegesetz -GEG) vom 8. August 2020 (BGBl. I S. 1728). https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&bk=Bundesanzeiger_BGBl&start=//*[@attr_id=%27bgbl107s1519.pdf%27]#__bgbl__%2F%2F*%5B%40attr_id%3D%27bgbl120s1728.pdf%27%5D__1631190966416

Referencing the German building codes, the years of construction and the level of thermo-modernization, the building's primary and final energy demand based on its year of construction period can be matched to the following[14]:

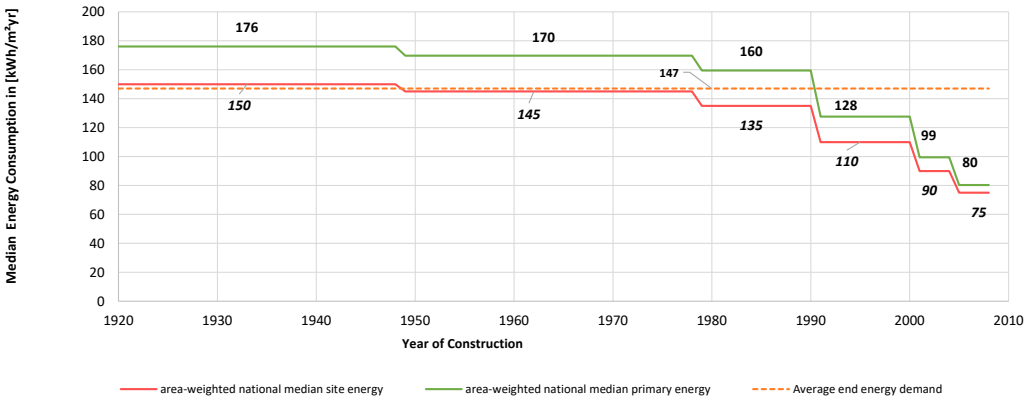


Figure 4-2: Annual and median final energy demand for different years of construction[14]

The number of buildings and their building portions (see Figure 4-1) are clustered based on different years of construction periods and the mandatory time and use of the building energy codes (see Table 4-1).

Therefore, a referencing of the building energy codes towards the year of construction and the number of buildings serves as the connection to match the codes' requirements for final energy demand towards the portion of buildings.

[14] Deutsche Energie-Agentur (DENA). dena-Gebäudereport Kompakt 2016. Statistiken und Analysen zur Energieeffizienz im Gebäudebestand.

4.3 Germany's National Residential Mean Final Energy Demand

Applying the number of buildings for each year of construction and building energy code (see Figure 4-1), the mean final energy demand for Germany's national residential building stock can be calculated to 147 kWh/m²year for the year 2020[5,8].

4.4 Germany's National Residential Mean Carbon Emissions Intensity

The energy consumption for heating of Germany's national residential buildings can be divided per one inhabitant into the following raw energy sources:

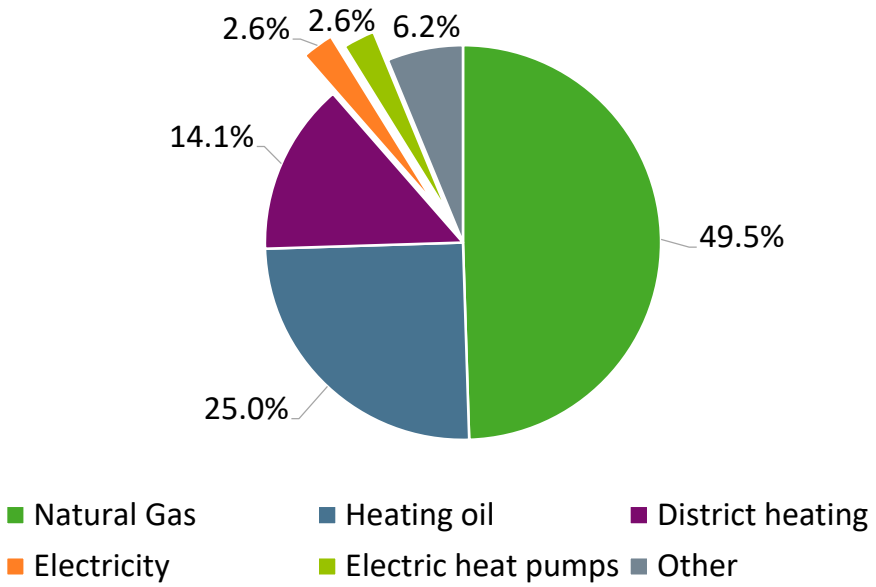


Figure 4-3: Structure of Germany's household energy consumption for heating in 2020[15]

The major energy carrier for residential buildings is natural gas with almost half of the energy consumption, followed by fuel oil and district heating.

[15] Bundesverband der Energie- und Wasserwirtschaft e.V. (BDEW). Beheizungsstruktur des Wohnungsbestandes in Deutschland 2020. Januar 2021. https://www.bdew.de/service/daten-und-grafiken/beheizungsstruktur-wohnungsbestand-deutschland/

For each fuel type, the standard associated equivalent carbon emissions are given in the following figure. The generation, distribution and use of district heat and electricity require a national approach for Germany's energy carrier since it varies for each county.

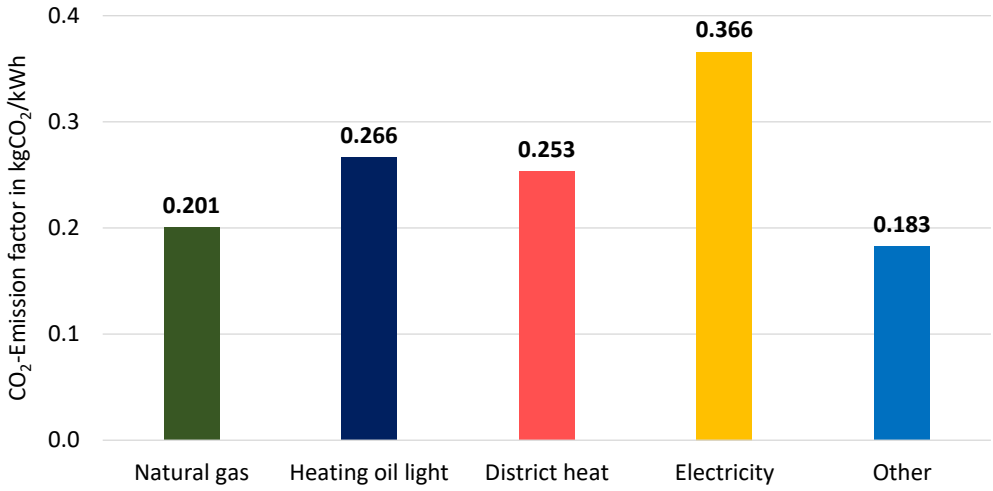


Figure 4-4: CO_2-Emissions factors for Germany (2019)[13,16-17]

The country-specific carbon emissions equivalents for electricity in Germany are 366 gCO_2 per kWh for the year 2020[17]. For district heating, the country-specific carbon emissions equivalents in Germany are stated with 253 gCO_2 per kWh for the year 2020[13].

Applying the carbon emissions equivalents to the distributed energy raw sources, the "national residential mean carbon emissions intensity" is calculated to 0.232 $kgCO_2$/kWh. Therefore, the national residential mean carbon emissions results into:

$$147\ kWh/m^2year\ X\ 0.232\ kgCO_2/kWh = 34.1\ kgCO_2/m^2year$$

for the mean national residential final energy demand of 147 kWh/m²year.

[16] Umweltbundesamt (UBA). Berichterstattung unter der Klimarahmenkonvention der Vereinten Nationen und dem Kyoto-Protokoll 2021. April 2021.
https://www.umweltbundesamt.de/sites/default/files/medien/5750/publikationen/2021-05-19_cc_43-2021_nir_2021_1.pdf

[17] Umweltbundesamt (UBA). Entwicklung der spezifischen Kohlendioxid-Emissionen des deutschen Strommix in den Jahren 1990 – 2020. Mai 2021.
Entwicklung der spezifischen Kohlendioxid-Emissionen des deutschen Strommix in den Jahren 1990 - 2020 (umweltbundesamt.de)

4.5 Eligibility for Green Bond

Climate Bonds Initiative's certification methodology for residential property climate bonds provides two methods in the latest Version of July 2020[3] from the low carbon buildings technical working group to fulfill compliance:

- Method 1: Benchmarking against local market carbon performance
- Method 2: Relative stringency of energy labels and rating tools

Method 1 is not applicable due to the fact, that the statistically representative sample and the 15th percentile of lowest carbon performance are not available for the local market benchmarking of residential and commercial buildings in Germany.

Furthermore, assets can be eligible through the property upgrade method (compare section 3.3).

4.6 Relative stringency of energy labels and rating tools

Method 2 "Relative stringency of energy labels and rating tools" is applicable to demonstrate the eligibility of a mechanism for the Green Bond and includes the following steps:

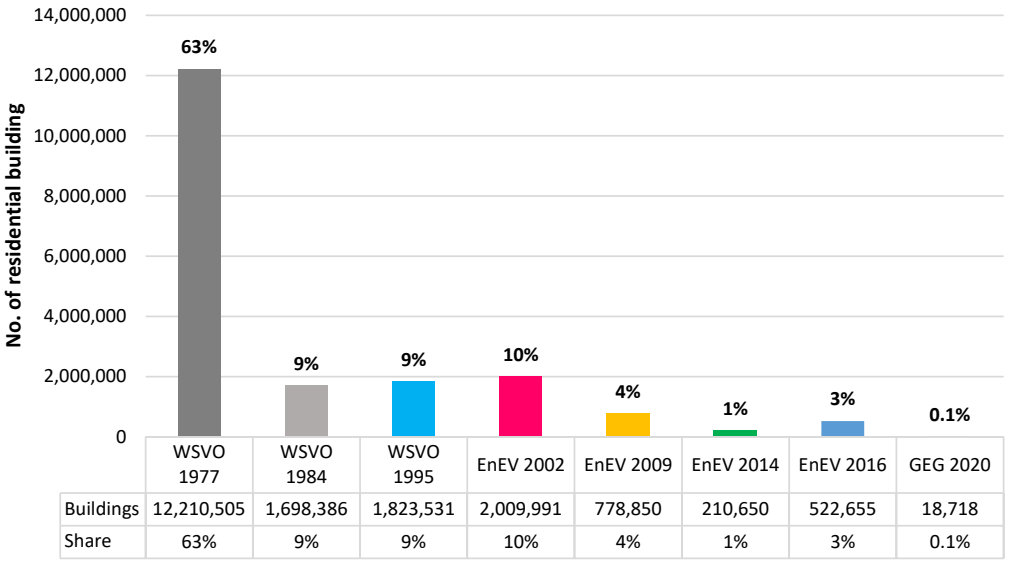
- Identification of a Database,
- Confirmation of sufficient sample size,
- Confirmation of representative Database,
- Determination of Minimum Criteria for Climate Bonds Certification.

The residential buildings in Germany are referenced with German building energy performance codes to comply a verified carbon performance database and to enable an analysis and comparison to the local market.

The summarized data provided by the official sources[5-8,14] fulfill CBI's requirement of enabling a statistically significant size of database for a sufficient sample confirmation.

The energy labelling schemes of the mandatory building energy performance codes (see Figure 4-1) do include a sufficient spread of different energy labels and can be considered representative of the market spread.

4.7 Eligibility Criteria for a Residential Green Bond



	WSVO 1977	WSVO 1984	WSVO 1995	EnEV 2002	EnEV 2009	EnEV 2014	EnEV 2016	GEG 2020
Buildings	12,210,505	1,698,386	1,823,531	2,009,991	778,850	210,650	522,655	18,718
Share	63%	9%	9%	10%	4%	1%	3%	0.1%

Figure 4-5: Portion of buildings referenced towards building energy codes

The clustered information analysis shows, that one promille of the buildings fulfill the requirements for GEG 2020, three percent fulfill the requirements for EnEV 2016, one percent fulfill the requirements for EnEV 2014, and four percent the requirements for EnEV 2009.

As a result, this analysis shows, that an asset which does comply with the requirements of the building energy code EnEV 2009, is positioned in the Top 15 % of the market and show eligibility for the Green Bond of ING-DiBa.

Fulfilling the requirements of EnEV 2002 positions the asset in the next 10 % of assets. Some buildings with EnEV 2002 could be positioned within the Top 15 % of the market, but not all. Therefore, the EnEV 2002 does not guarantee, that an asset belongs to the Top 15 % of the market. For this reason, complying with EnEV 2002 cannot be used to demonstrate eligibility for ING-DiBa's Green Bond.

The overall goal of the low buildings criteria for the green bond is to "establish emissions trajectories (Figure 4-6) compatible with net zero carbon emissions by 2050, so that only buildings performing within these trajectories would be eligible […]"[18] for a green bond.

[18] Climate Bonds Initiative. Aligning Buildings with the Paris Climate Agreement: Insights and Developments from the Green Bond Market. Aligning Buildings with a Climate Compatible 2050. https://www.climatebonds.net/files/files/SEIM-01A(1).pdf

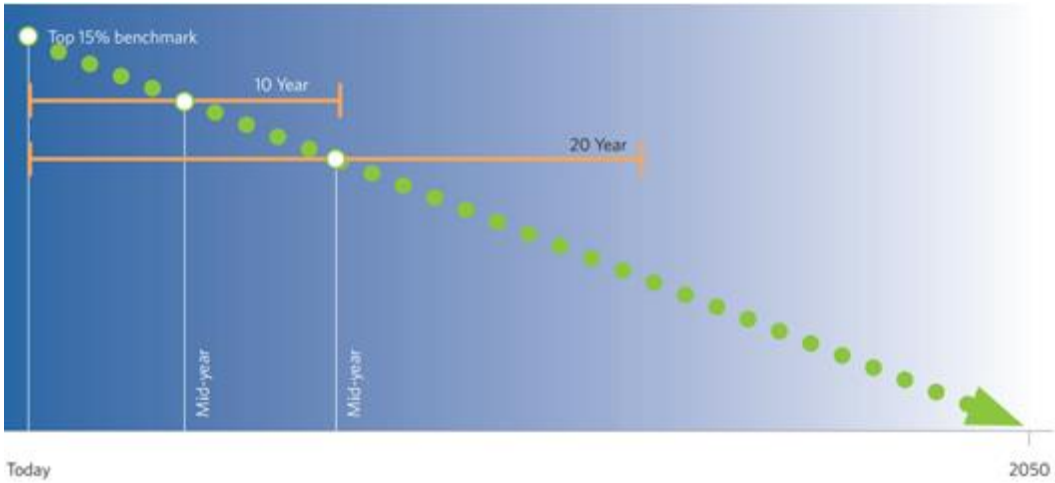


Figure 4-6: CBI's low carbon trajectory example

A recent survey of building owners[19] with over 1,211,772 assets, shows, that single-family houses with final energy consumption < 70 kWh/m²year or less represent also the Top 15% of its local market.

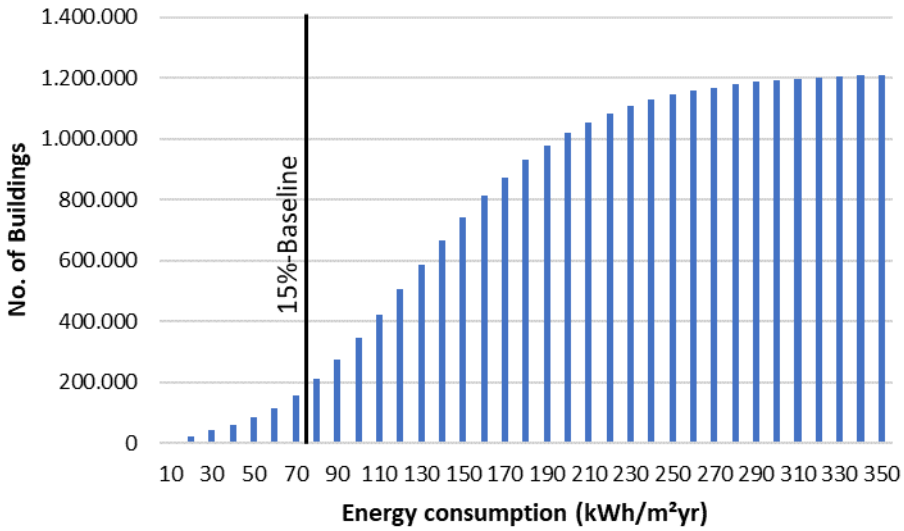


Figure 4-7: Drees & Sommer figure based on Wohngebäude.info - Single Family Houses and their energy consumption

[19] Wohngebäude.info CO2online. Wohnen und Sanieren. Wohngebäude-Statistiken 2002 bis heute. https://www.wohngebaeude.info

A possible low carbon trajectory for ING-DiBa's green bond therefore connects

- the basis requirement of building energy consumption with final energy consumption ≤ 70 kWh/m²year for single family houses and for multi-family houses, towards
- the zero-emission-goal in 2050 with zero non-renewable final energy or carbon emissions.

The low carbon trajectory is based on the year of issuance of the green bond and the applied duration of the green bond due to the fact that for each year towards 2050, the requirements for carbon emissions and non-renewable final energy are getting more stringent.

Figure 4-8 visualize the low carbon trajectories for single- and multi-family house based on the building energy consumption serving as the 15th percentile baseline for the market.

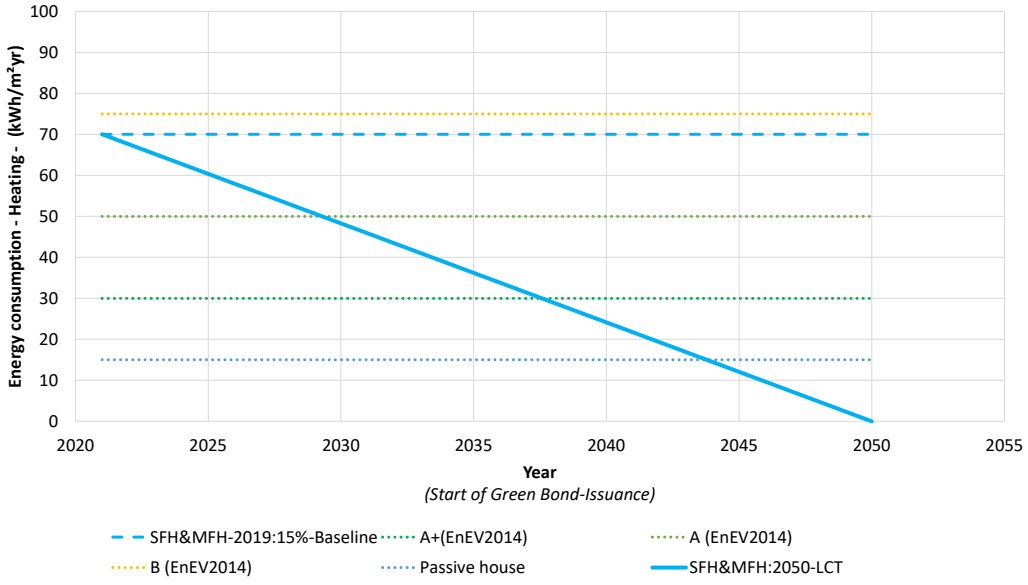


Figure 4-8: Exemplary low carbon trajectories for single- and multifamily houses

Besides the proxy method of stringency of energy labels and rating tools, property upgraded assets are eligible for the green bond once their percentual improvement in carbon emissions or final energy demand or consumption complies with the carbon target illustrated in Figure 4-9.

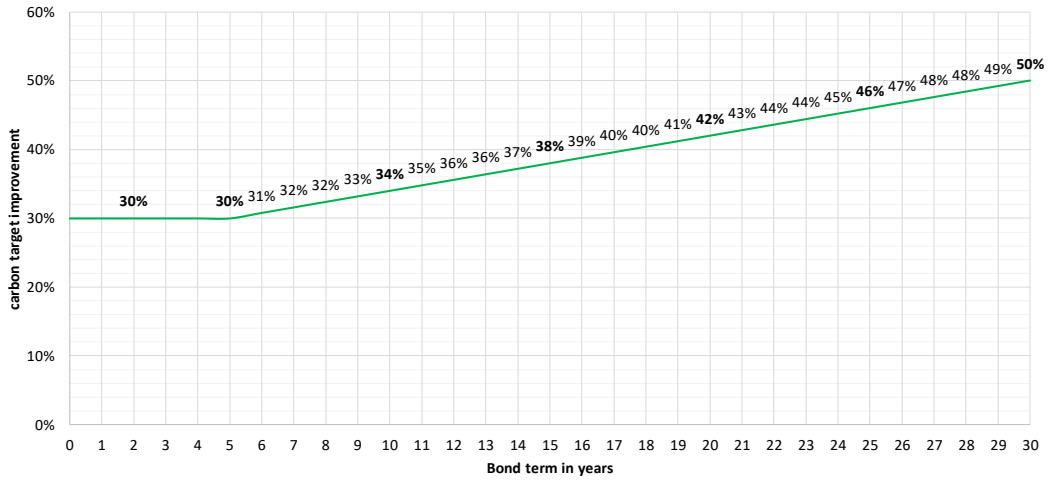


Figure 4-9: Required minimum improvement for different bond terms

Furthermore, there are existing proxies from the climate bonds initiative, to define the Top 15 % residential German assets by using the energy efficiency rating of:

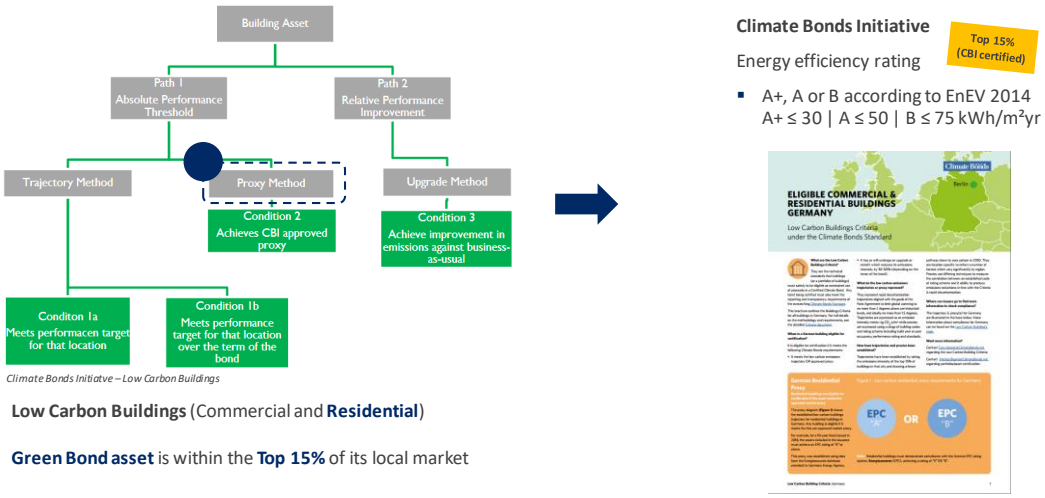


Figure 4-10: Drees & Sommer figure, based on CBI's residential proxy for Germany[20]

However, since the availability of energy consumption data for ING DiBa's assets is limited, we recommend using the existing data of year of construction, to align the corresponding building energy code and use the criteria of EnEV 2009 or newer, to represent the Top 15 % benchmark.

[20] Climate Bonds Initiative. Eligible Commercial & Residential Buildings Germany. Low Carbon Buildings Criteria under the Climate Bonds Standard. https://www.climatebonds.net/files/files/Crit%20Brochure_Germany%20Brochure%281%29.pdf

4.8 Summarized Eligibility Criteria

Green buildings: defined as the financing or refinancing buildings which meet regional, national or internationally recognized regulations, standards or certifications:

Residential real estate:

- New or existing residential buildings belonging to the Top 15 % low carbon buildings in Germany.
- New or existing residential buildings with an Energy Performance Certificate (EPC) rating of A+ or A in compliance with Climate Bonds Initiative (CBI)'s established Residential Proxy for Germany.
- New or existing residential buildings with year of construction based on year of bond issuance and bond duration:
  - Single-Family House built after 2009, fulfilling EnEV2009, based on the year of construction.
  - Threshold is subject to change, based on year of bond issuance, bond duration, and is mandatory to comply with Top 15 %-approach.
- Refurbished Commercial buildings with an improved energy efficiency reducing carbon emissions by at least 30 % based on bond term.

Table 4-2: Green Bond - summarized criteria

		Residential buildings	Single-Family	Multi-Family
New or existing buildings	**1)**	**Nearly Zero Energy Building** Built 2021 or newer	At least 10 % lower than the requirements for the primary energy demand of the "Nearly Zero Energy Building" standard (NZEB). Based on the "Energy Performance of Buildings Directive (EBPD)", the NZEB standard is implemented in the GEG requirements.	
			Small SFH: PE <= 63.9 kWh/(m²a) Large SFH: PE <= 37.8 kWh/(m²a)	Small MFH: PE <= 45.9 kWh/(m²a) Large MFH: PE <= 39.6 kWh/(m²a)
Building Acquisition & Ownership	**2)**	**Nearly Zero Energy Building** Built before 31/12/2020	„EnEV 2014: requirements for 2016“ *(“Zweite Verordnung zur Änderung der Energieeinsparverordnung vom 18. November 2013”) equal to requirements of the actual building code GEG (Gebäudeenergiegesetz)*	
			Small SFH: PE <= 71 kWh/(m²a) Large SFH (b): PE <= 53 kWh/(m²a)	Small MFH: PE <= 51 kWh/(m²a) Large MFH: PE <= 44 kWh/(m²a)
	3)	**Energy performance certificate** Built before 31/12/2020	Energy performance label A+ or A according to EnEV 2016 and GEG 2020 A+ ≤ 30 | A ≤ 50 kWh/m²a	
	4)	**Energy consumption** Built before 31/12/2020	Site energy consumption < 70 kWh/m²a Primary energy consumption < 72 kWh/m²a CO_2-emissions < 17 kgCO2/m²a	
	5)	**Top15% Building Energy code** primary energy requirement Built before 31/12/2020	Building code EnEV 2009 or better	
Renovation	**6)**	**Property Upgrade**	Major renovation meets cost-optimal minimum energy performance requirements in accordance with the Energy Performance of Buildings Directive (EBPD).	
			Relative improvement in primary energy demand or carbon emissions ≥ 30% in comparison to the performance of the building before the renovation.	

Table 4-2 summarizes the green bond criteria for residential buildings in ING-DiBa’s asset portfolio.

4.9 Aggregation of assets and pooling

The aggregation of assets follows the "Simple Aggregation"-methodology based on CBIs' residential property certification methodology for climate bonds. Assets can be pooled into sub-pools, once they are compliant with the criteria for the green bond defined in section 5.3 "Summarized Eligibility Criteria".

The following sub-pools are applied to diverse the green covered bond portfolio based on carbon performance and energy standards:

1) Usage Type

- Single family house (detached)
- Two-family house
- Terraced house
- Condominium
- Semi-detached house

2) Building Energy Code

- EnEV 2009
- EnEV 2014
- EnEV 2016
- GEG 2020

These sub pools can be adjusted to ING-DiBa's requirements.

5 Green Bonds' Environmental Impact

5.1 Final Energy Savings

Savings associated with an eligible green bond asset are calculated against the mean final energy demand for Germany's national residential building stock of 147 kWh/m²year (see section 4.3).

e. g. a 150 m² Single-Family House within the Green Bond with a final energy demand of 65 kWh/m²year provides environmental savings of:

$$(147 - 65)\ \text{kWh/m}^2\text{year} = 82\ \text{kWh/m}^2\text{year}$$

$$82\ \text{kWh/m}^2\text{year} \times 150\ \text{m}^2 = 12.3\ \text{MWh/year}$$

If the asset does not have an allocated final energy consumption or final energy demand, the asset's current final energy demand will be estimated on the building energy code and its referenced mean value illustrated in Figure 4-2. In case there is no information available on the building energy code, the year of construction and its associated building energy code will be used to determine the referenced mean value.

5.2 Greenhouse gases' carbon emissions avoidance

Avoided greenhouse gases' carbon emissions associated with an eligible green bond asset are calculated against the national residential mean carbon emissions of 34.1 $kgCO_2/m^2year$ (including the carbon intensity of 0.232 $kgCO_2/kWh$).

e. g. a 150 m² Single-Family House within the Green Bond with a final energy demand of 65 kWh/m²year provides avoided greenhouse gases carbon emissions of:

$$(147 - 65)\ \text{kWh/m}^2\text{year} \times 0.232\ \text{kgCO}_2/\text{kWh} = 19\ \text{kgCO}_2/\text{m}^2\text{year}$$

$$19\ \text{kgCO}_2/\text{m}^2\text{year} \times 150\ \text{m}^2 = 2.85\ \text{tCO}_2/\text{year}$$

6 Portfolio Screening

ING-DiBa's portfolio, as reported with the portfolio cut on 31.08.2021, has been evaluated based on the proposed green bond methodology covering a green bond issuance starting from 31.08.2021 with a duration of ten years until 31.08.2031.

The following figures summarize ING-DiBa's assessed portfolio:

- Number of buildings: 74,664
- Exposure: 8,117 bn EUR
- Usage: Residential (Single-Family)

ING-DiBa's Green Bond portfolio:

- Number of buildings: 20,637
- Exposure: 2,891 bn EUR
- Environmental Savings:
  - Final Energy: 165,093 MWh/year
  - Carbon Emissions: 38,302 tCO_2/year

Further details can be found in the appendix.

6.1 Number of Buildings

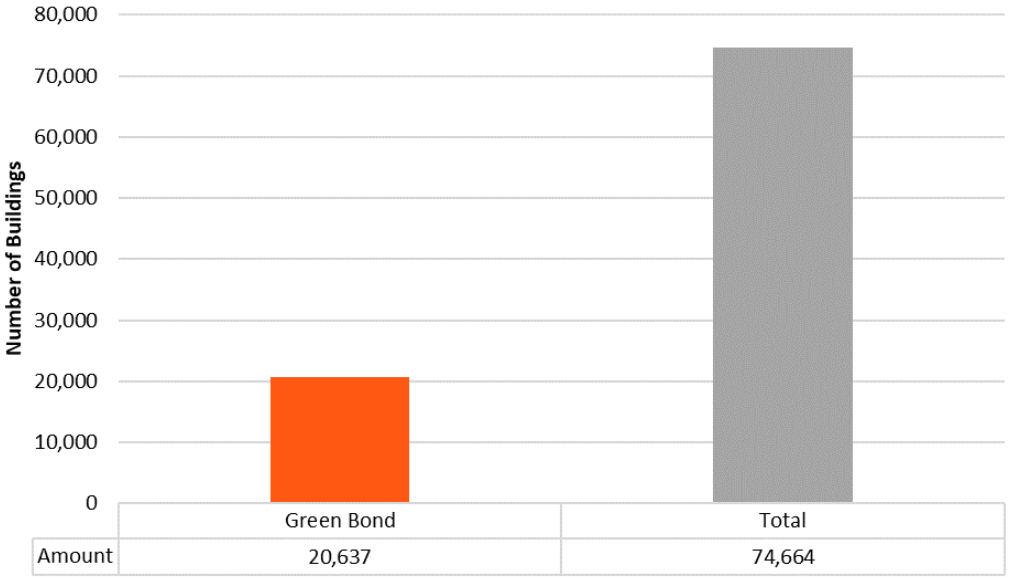


Figure 6-1: Number of buildings within ING-DiBa's portfolio

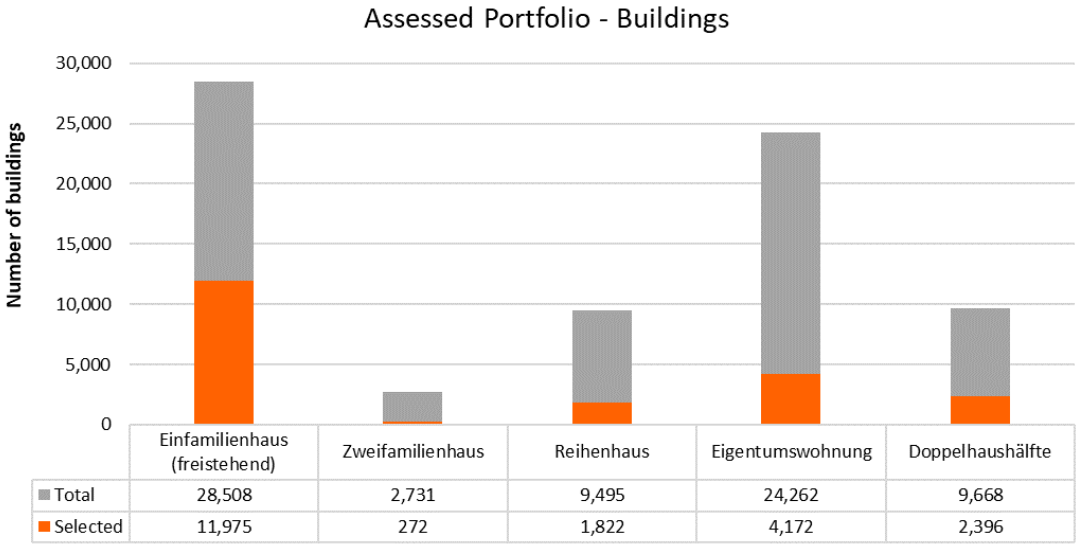
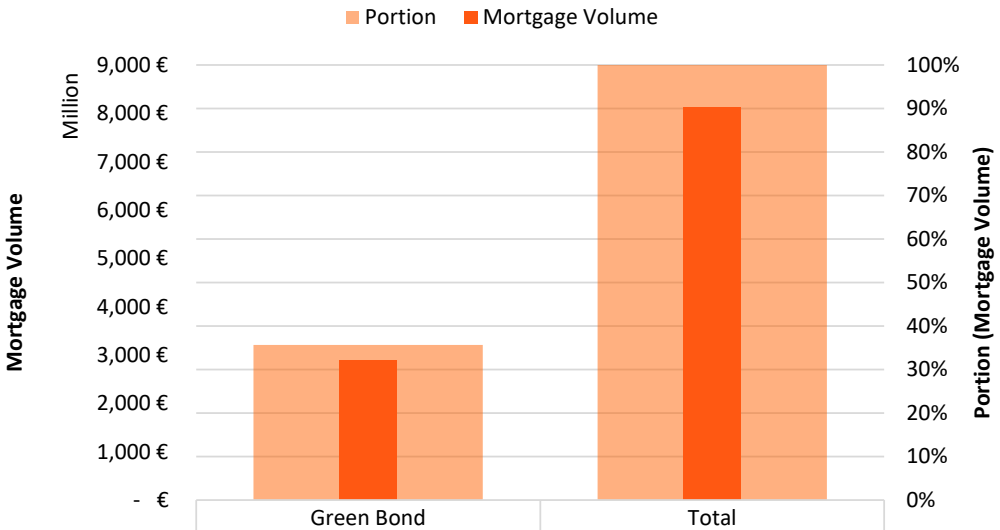


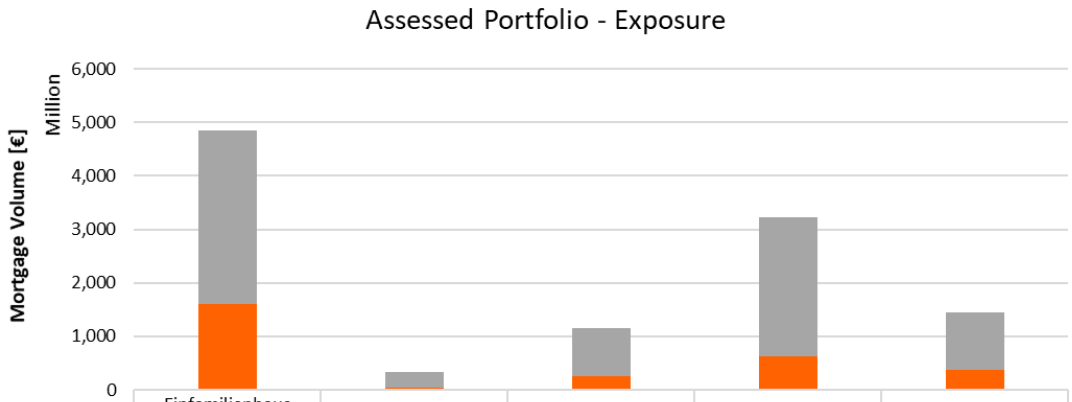
Figure 6-2: Number of buildings within ING-DiBa's assessed portfolio by usage type

6.2 Exposure



	Green Bond	Total
Portion	36%	100%
Mortgage Volume	2,891,142,225 €	8,117,179,602 €

Figure 6-3: Exposure of ING-DiBa's assessed portfolio



	Einfamilienhaus (freistehend)	Zweifamilienhaus	Reihenhaus	Eigentumswohnung	Doppelhaushälfte
Total	3,245,426,919 €	298,048,444 €	906,536,837 €	2,595,314,470 €	1,071,852,932 €
Selected	1,601,784,732 €	41,467,676 €	249,487,116 €	630,888,297 €	367,514,404 €

Figure 6-4: Exposure of ING-DiBa's assessed green bond portfolio

6.3 Building Area

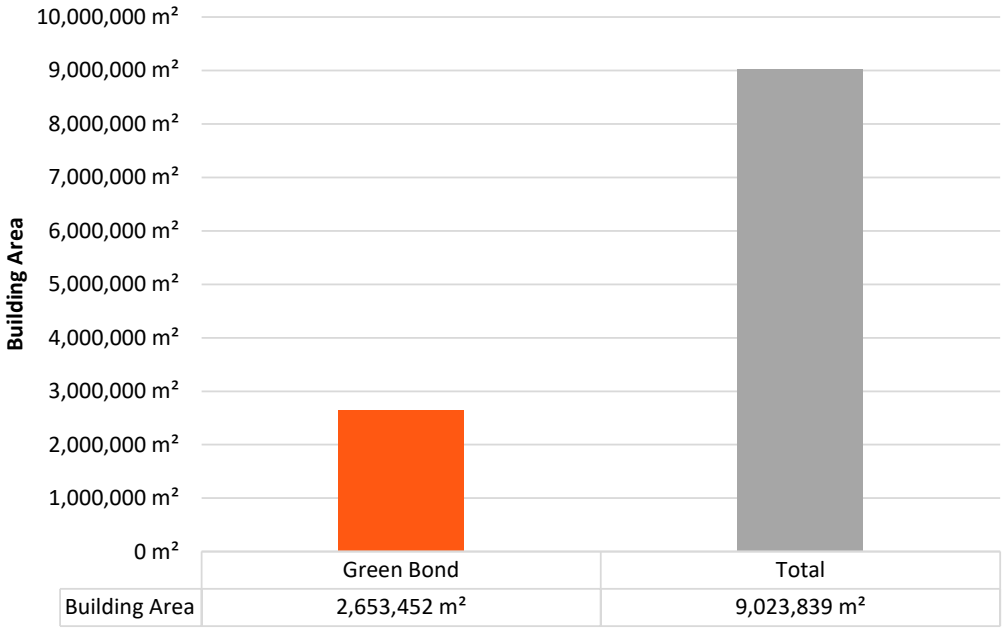


Figure 6-5: Building area of ING-DiBa's assessed portfolio

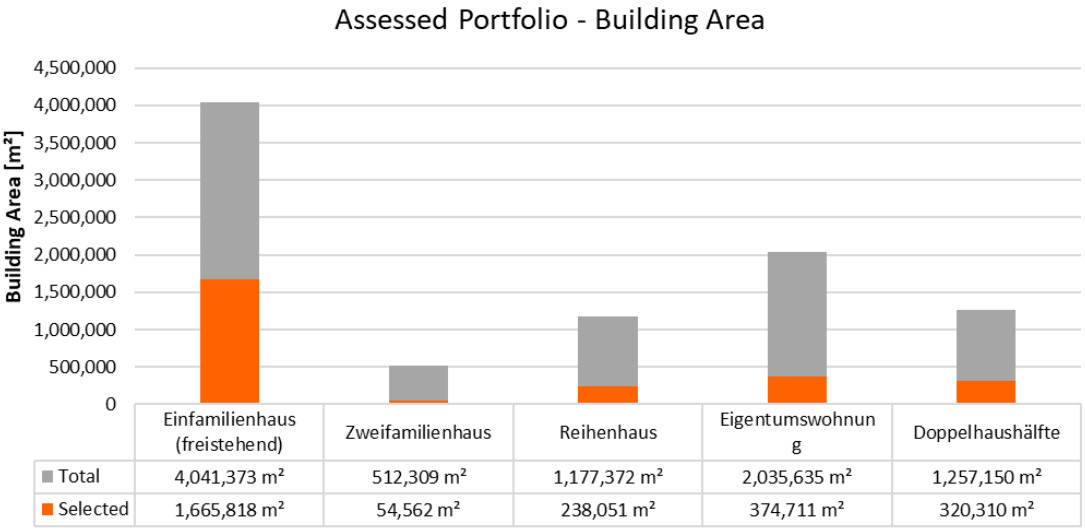


Figure 6-6: Building area of ING-DiBa's assessed portfolio by usage type

6.4 Building Age vs. Exposure

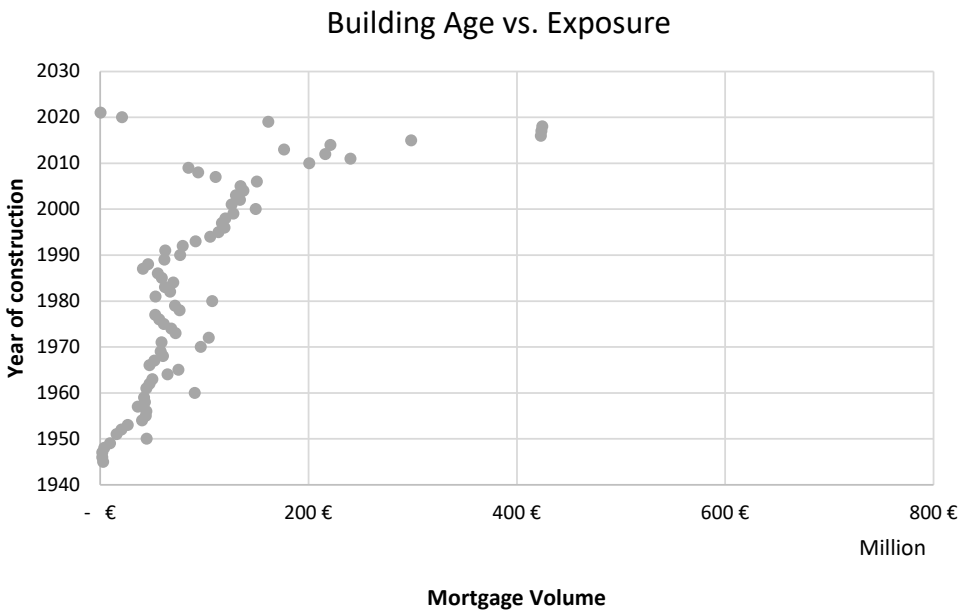


Figure 6-7: Building age related to exposure within ING-DiBa's assessed portfolio

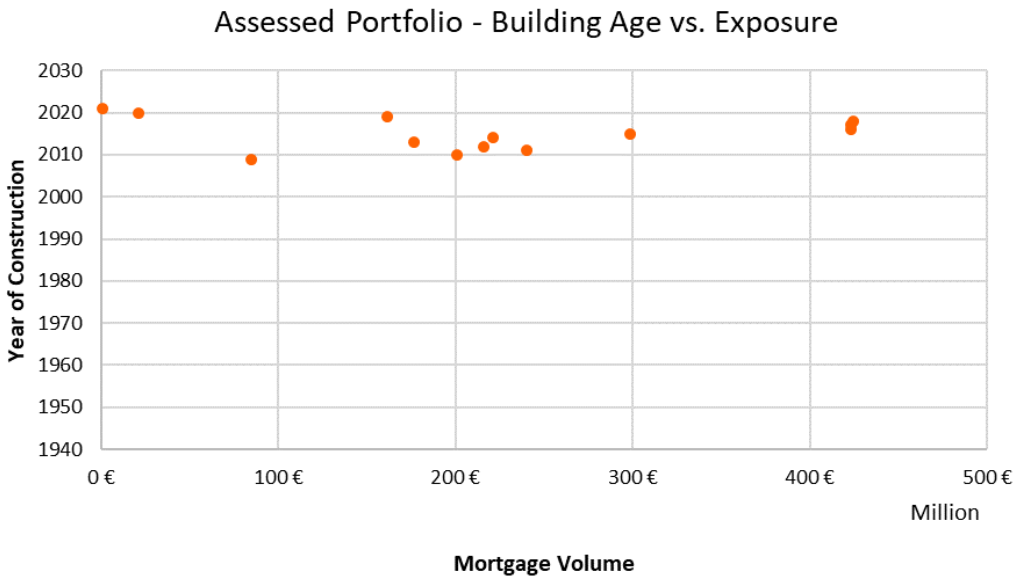
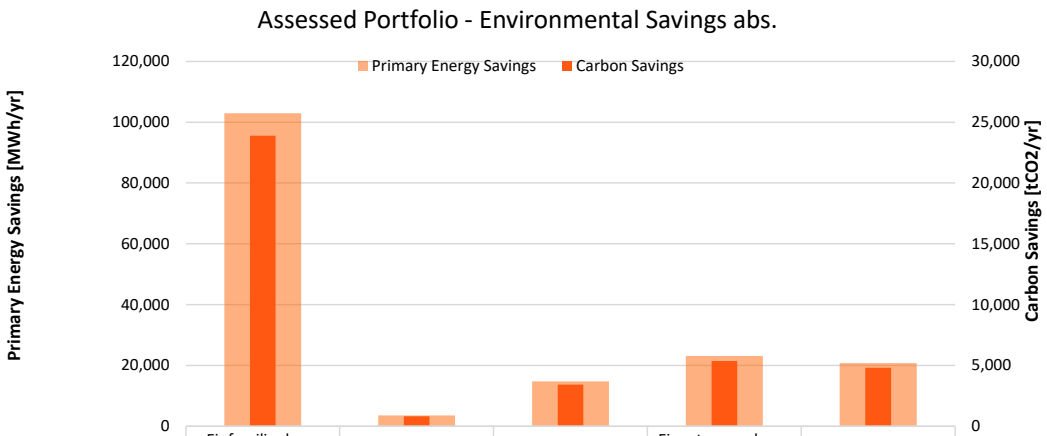


Figure 6-8: Green Bonds' building age related to exposure within ING-DiBa's assessed portfolio

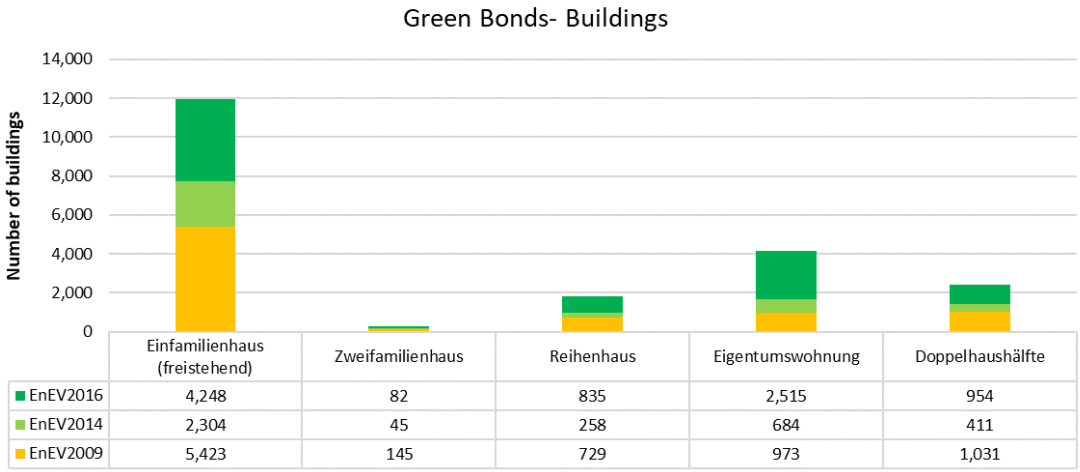
6.5 Environmental Savings



	Einfamilienhaus (freistehend)	Zweifamilienhaus	Reihenhaus	Eigentumswohnung	Doppelhaushälfte
Primary Energy Savings	102,948 MWh/year	3,536 MWh/year	14,712 MWh/year	23,142 MWh/year	20,756 MWh/year
Carbon Savings	23,884 tCO2/year	820 tCO2/year	3,413 tCO2/year	5,369 tCO2/year	4,815 tCO2/year

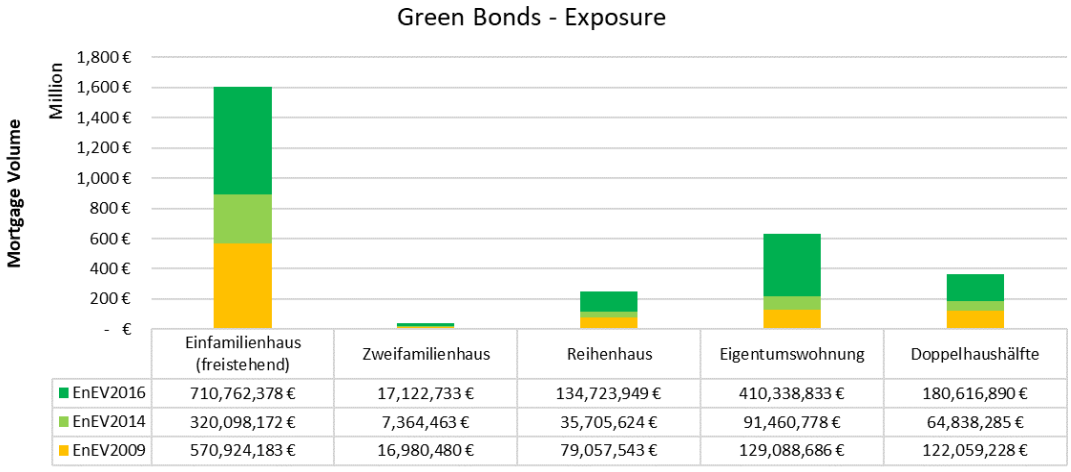
Figure 6-9: Environmental Savings by ING-DiBa's assessed Green Bonds portfolio

6.6 Green Bond Sub Pools



	Einfamilienhaus (freistehend)	Zweifamilienhaus	Reihenhaus	Eigentumswohnung	Doppelhaushälfte
EnEV2016	4,248	82	835	2,515	954
EnEV2014	2,304	45	258	684	411
EnEV2009	5,423	145	729	973	1,031

Figure 6-10: Number of buildings within ING-DiBa's Green Bond Sub pools



	Einfamilienhaus (freistehend)	Zweifamilienhaus	Reihenhaus	Eigentumswohnung	Doppelhaushälfte
EnEV2016	710,762,378 €	17,122,733 €	134,723,949 €	410,338,833 €	180,616,890 €
EnEV2014	320,098,172 €	7,364,463 €	35,705,624 €	91,460,778 €	64,838,285 €
EnEV2009	570,924,183 €	16,980,480 €	79,057,543 €	129,088,686 €	122,059,228 €

Figure 6-11: Exposure of building within ING-DiBa's Green Bond Sub pools

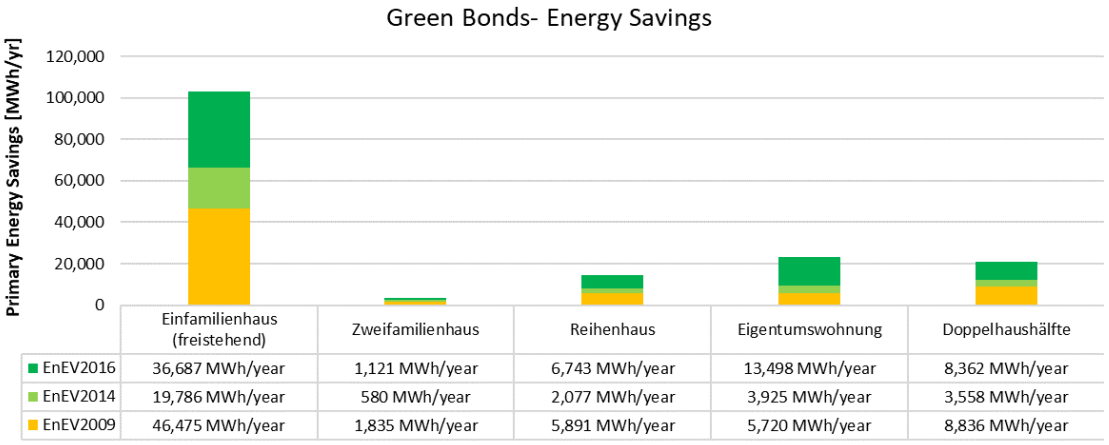


Figure 6-12: Final energy savings of ING-DiBa's Green Bond Sub pools

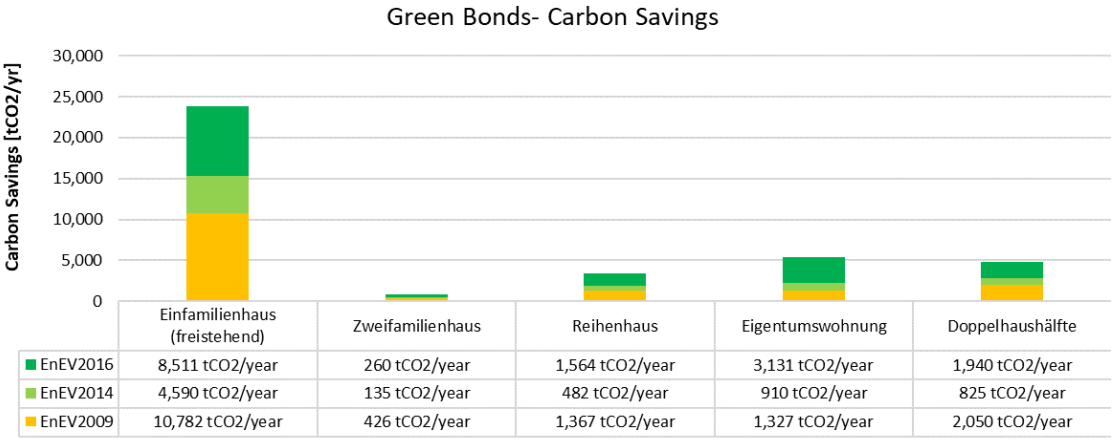


Figure 6-13: Carbon savings of ING-DiBa's Green Bond Sub pools

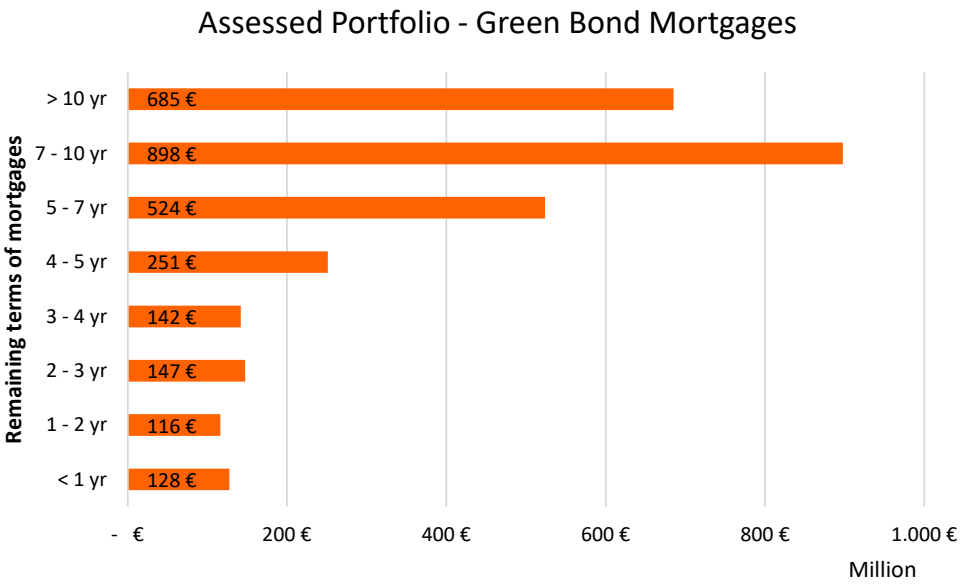


Figure 6-14: Green Bond assets - Remaining term of mortgages

7 Impact Reporting

A tool for continuous impact reporting based on the drafted methodology can be found in the appendix 10.1.

This tool is a Microsoft Excel-based spreadsheet, which allows the client to insert new assets and track their eligibility for the Green Bond. Furthermore, it enables a deep analysis and evaluation of the assets including their environmental energy and carbon emissions savings.

A detailed breakdown for ING-DiBa' assessed portfolio and its buildings' usage, exposure and environmental savings can be found in the sections 7.1 to 7.6.

The harmonized framework table completes the continuous impact reporting.

Low Carbon Buildings	Date of Issuance	Type	Signed Amount[a]	Share of Total Portfolio Financing[b]	Eligibility for green bonds[c]	Average portfolio lifetime[d]	Annual final energy savings[e]	Annual CO2 emissions avoidance[f]
Unit	*[dd.mm.yyyy]*	*[-]*	*[EUR]*	*[%]*	*[%]*	*[years]*	*[MWh/year]*	*[tCO2/year]*
ING-DiBa AG Green Bond	*31.08.2021*	*Low Carbon Building*	*2,891,142,225*	*100.0*	*100*	*9.6*	*165,093*	*38,302*
Einfamilienhaus (freistehend)	31.08.2021	Low Carbon Building	1,601,784,732	55.4	100	10.0	102,948	23,884
Zweifamilienhaus	31.08.2021	Low Carbon Building	41,467,676	1.4	100	6.8	3,536	820
Reihenhaus	31.08.2021	Low Carbon Building	249,487,116	8.6	100	7.2	14,712	3,413
Eigentumswohnung	31.08.2021	Low Carbon Building	630,888,297	21.8	100	9.1	23,142	5,369
Doppelhaushälfte	31.08.2021	Low Carbon Building	367,514,404	12.7	100	10.4	20,756	4,815

[a] Legally committed signed amount by the issuer for the porfolio or portfolio components eligible for green bond financing.
[b] Portion of the total portfolio cost that is financed by the issuer.
[c] Portion of the total portfolio cost that is eligible for Green Bond.
[d] average remaining term of Green Bond loan within the total portfolio.
[e] Final energy savings calculated using the difference between the top 15% and the national building stock benchmarks
[f] Greenhouse gas emissions avoidance determined by multiplying the final energy savings with the carbon emissions intensity

Figure 7-1: ING-DiBa's Green Bond - Portfolio Results for 2021

The impact reporting for the year 2021 was carried out by Drees & Sommer.

Future adaptions can be offered to ING-DiBa on demand for further consulting services.

8 Further development of Methodology & Process

Future adaptations of the impact reporting for the Green Bond methodology, requirement values, benchmarks and reference values e. g. EU laws, local laws, technical conditions, energy standards etc. can be offered to ING-DiBa on demand for further consulting services.

This report covers 39 pages (incl. cover sheet and table of content, without appendix).

Stuttgart, 2021-09-23

Drees & Sommer
Advanced Building Technologies GmbH

Johannes Hopf

Claudio Tschätsch

Anika Zwiener

Johannes Rößler

9 Abbreviations

BPIE	Buildings Performance Institute Europe
CBI	Climate Bonds Initiative
CO_2	Carbon Dioxide
DS ABT	Drees & Sommer Advanced Building Technologies GmbH
EEA	European Environment Agency
EPC	Energy Performance Certificate
EU	European Union - Europe
GB	Green Bond
GCB	Green Covered Bond
Gj	Giga joule – unit for energy demand or consumption
ING-DiBa	ING DiBa AG
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilo Watt hours – unit for energy demand or consumption
LCT	Low Carbon Trajectory
MFH	Multi-Family House
m^2	Square meter
NEEAP	National Energy Efficiency Action Plan
FE	Final Energy
EnEV	German regulation, Germany's building energy code
SFH	Single Family House
TABULA	Typology Approach for Building Stock Energy Assessment

10 Appendix

10.1 Impact Reporting Tool "20210923_9563_Impact_Reporting_DS_stat.xlsb"