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PKO BANK HIPOTECZNY

SUSTAINABILITY CONSULTING – REVISED GREEN BOND METHODOLOGY

2022-05-25

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AGENDA

SUSTAINABLE FINANCE – ELIGIBILITY CRITERIA FOR CLIMATE CHANGE MITIGATION

Economic activity	Screening Criteria	Residential *Single-Family*[1]	Residential *Multi-Family*[2]
7.1 Construction of new buildings Built 01/01/2021 or newer	**Nearly Zero-Energy Building** Primary energy demand minus 10%	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 implemented in Technical Condition 2021 (TC 2021) requirements.	
	Indicative reference values:	PED ≤ 63 kWh/(m²year)	PED ≤ 58.8 kWh/(m²year)
7.2 Renovation of existing buildings Built before 31/12/2020	**Major Renovation** Cost optimal level	The building renovation complies with the applicable requirements for major renovations as defined in the Energy Performance of Buildings Directive (EBPD), based on the cost optimal level as defined in Technical Condition 2014 (TC 2014).	
	Property Upgrade Relative improvement ≥ 30% in primary energy demand	Relative improvement in primary energy demand ≥ 30% in comparison to the performance of the building before the renovation. Reductions through renewable energy sources are not taken into account.	
7.7 Acquisition and ownership of buildings Built before 31/12/2020[3]	**top 15%** of the national existing building energy code	Technical condition TC 2017 or newer	
	top 15% of the national existing building stock	PED ≤ 95 kWh/m²year FED ≤ 67.7 kWh/m²year	PED ≤ 85 kWh/m²year FED ≤ 60.6 kWh/m²year

Source: Drees & Sommer low carbon building criteria are based on EU Taxonomy (Delegated Act – July 2021). Criteria are valid for assets located in Poland. Status: May 2022

Green Bond criteria - *The object fulfills one of the following criteria:*				Residential *Single-Family*[1] and *Multi-Family*[2]
Climate Bonds Initiative	New Construction **or** Existing Buildings	**1)**	**Energy standard or year of construction is equal or newer** *based on CBI's low carbon buildings criteria in compliance with CBI's established residential market proxy for Poland*	New buildings complying with Technical Note 2017 or later by year of construction are automatically eligible for qualification for bonds where the mid-point of the bond term is no later than 2025.
	Existing Buildings	**2)**	**Property upgrade** *in compliance with CBI's established residential property upgrade methodology*	Major renovation with an improvement in the CO2 emissions figure from EPC from before and after the retrofit, based on tenor of bond, which meet the requirement of Technical Note 2014 (issued after July 2015). Minimum improvement in carbon emissions ≥ 30% . Term 1-5 years: 30% improvement | Term 5-30 years: 30%-50% linear improvement | Term ≥ 30 years : 50% improvement

[1]SFH: Single-Family house with 1-2 units | [2] MFH: Multi-Family house with >2 units | PED = primary energy demand | FED = Final energy demand | [3] For buildings built 01/01/2021 or newer, the criteria in 7.1 are required to comply with .

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Energy & CO2-Benchmarks – residential buildings in Poland

Ø-Reference values: Energy	Ø-Reference values: CO_2	
Building stock weighted reference benchmarks: Final energy: **Ø191.5 kWh/(m²a)** Primary energy factor: **Ø1.403** Primary energy: **Ø268.7 kWh/(m²a)**	Building stock weighted reference benchmark: CO_2-Intensity: **Ø 0.375 kgCO_2/kWh**	Building stock weighted reference benchmark: **71.8** kgCO_2/(m²a)

Source: Drees & Sommer low carbon building benchmarks
Benchmarks are valid for assets located in Poland. Status: May 2022

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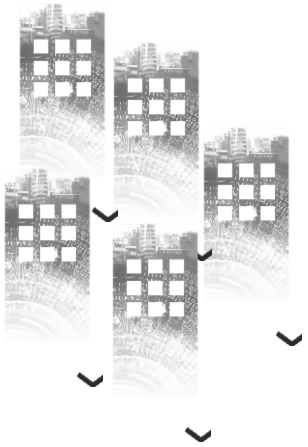
Methodology – Green Bonds & EU Taxonomy

Green Finance Framework

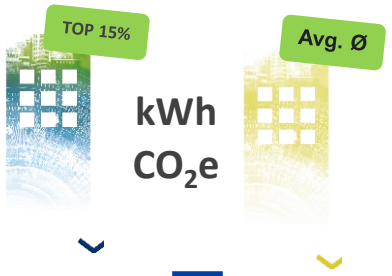
Portfolio
(Data)



Portfolio Assessment

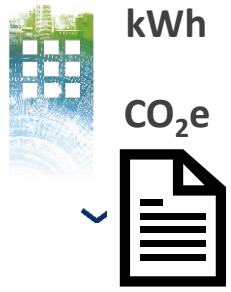
Portfolio
(identified green assets)

Reference Benchmarks Energy & GHG



Portfolio Impact

Impact Reporting
(Energy and GHG savings)



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Energy standards – Nearly-Zero-Energy-Building (NZEB)

Directive 2010/31/EU:

- Implementation of a “Nearly-Zero-Energy-Building" as a standard for all new buildings since 2021, for public authority buildings already since 2019: This standard describes a building that has a very high energy performance. "Near-zero or very low energy demand should be met to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby." (Article 9)
- Calculation of the "cost-optimal level" for energy requirements for new and existing buildings by the member states and comparison with the currently valid minimum requirements.

„Nearly-Zero-Energy-Building“ NZEB:

Each member state of the EU is obliged to implement the requirements of the EPBD Directive ("**European Performance of Buildings Directive**") in national law by 2018. This also includes the obligation to define a new energy standard for buildings since 2021, which are defined as **"NZEB = Nearly-Zero-Energy-Buildings"**. In Poland, this is fulfilled by the “**Technical Condition 2021** “.

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Energy standards – EU-cost optimal level in Poland

Sprawozdanie ze wszystkich danych wejściowych i założeń użytych do celów obliczeń optymalnego pod względem kosztów poziomu wymagań minimalnych dotyczących charakterystyki energetycznej, wynikające z art. 5 ust. 2 dyrektywy 2010/31/UE

1. BUDYNKI REFERENCYJNE

1.1. Sprawozdanie dotyczące wszystkich budynków referencyjnych oraz tego, w jakim stopniu są one reprezentatywne dla budynków, należy sporządzić przy użyciu tabeli 1 (istniejące budynki) oraz tabeli 2 (nowe budynki). Dodatkowe informacje można dodać w załączniku.

1.2. Proszę podać definicję wartości referencyjnej powierzchni podłogi stosowanej w Państwa kraju i proszę wskazać, jak się ją oblicza.

Wartość referencyjnej powierzchni podłogi jest to wartość powierzchni ogrzewanej (powierzchni o regulowanej temperaturze) budynku, o której mowa w rozporządzeniu Ministra Infrastruktury i Rozwoju z dnia 27 lutego 2015 r. w sprawie metodologii wyznaczania charakterystyki energetycznej budynku lub części budynku oraz świadectw charakterystyki energetycznej (Dz. U. poz. 376, z późn. zm.).

Table 1

Reference building for existing buildings (major refurbishment)

Existing buildings	Building geometry (1)	Shares of window area on the building envelope and windows with no solar access	Floor area in m^2 as used in building code	Description of the building (2)	Description of typical building technologies (3)	Average energy performance kWh/(m^2·year) (prior to investment)		Component level requirements (typical value)
(1) Single-family buildings and subcategories								
One-storey single-family building,	Single-storey detached single-family building with utility attic, located in Warsaw Building built in 2009 Compactness (shape) coefficient: A/V_e=0.80 1/m. Wall surfaces: 157.34 m^2	0.154	116.7	Natural ventilation. Airtightness: infiltration rate for the building: 3.0 1/h Internal temperature t_i=20°C.	Thermal transmittance U [W/m^2·K]: • external walls 0.30 • floor 0.45 • roof 0.25 • external doors 2.60 • windows 1.8 Share of thermal bridges 8.70%. Solar radiation transmittance g=0.70 No shading of the building No passive systems. Water heating with sectional or panel radiators in the case of central and local control with a proportional thermostatic valve with the proportionality range of P-2K, water central heating with a local heat source located in the heated building with insulated pipework,	Type of heat source	EP [kWh/(m^2·year)]	Current requirements for the building undergoing refurbishment Thermal transmittance U [W/m^2·K]: • external walls 0.23 • ground flooring 0.30 • roof 0.18 • external doors 1.5 • windows 1.1
						coal-fired boiler (reference)	275.48	
						gas boiler	231.04	
						Boiler using biomass	66.41	
						Geothermal heat pump	130.97	

The calculation of the **cost-optimal level** provides the basis whether a member state has to tighten the energy standards (energy requirements) or not.

In 2018, Poland published a report on this subject ("**Report on all input data and assumptions used for calculating cost-optimal levels of minimum energy performance requirements laid down in Article 5(2) of Directive 2010/31/EU**").

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Energy Performance Building Codes in Poland

Name	Abbreviation	Year
▪ PN-57/B-02405 - Współczynniki przenikania ciepła k dla przegród budowlanych - Wartości liczbowe	PN-57	1957-1964
▪ PN-64/B-03404 - Współczynnik przenikania ciepła k dla przegród budowlanych	PN-64	1964-1974
▪ PN-74/B-034042 - Współczynnik przenikania ciepła k dla przegród budowlanych	PN-74	1974-1982
▪ PN-82/B-02020 - Ochrona cieplna budynków	PN-82	1982-1991
▪ PN-91/B-02020 - Ochrona cieplna budynków	PN-91	1991-2002
▪ Dz. U. 2002 nr.75 poz.690 - Rozporządzenie sprawie warunków technicznych, jakim powinny odpowiadać budynki i ich usytuowanie	TC 2002	2002-2008
▪ Dz. U. 2008 nr.201 poz.1238 - Zmieniające rozporządzenie TC2002	TC 2009	2009-2013
▪ Dz. U. 2013 poz. 926 - Zmieniające rozporządzenie z TC2009	TC 2014	2014-2016
▪ Dz. U. 2013 poz. 926 - Zmieniające rozporządzenie z TC2014	TC 2017	2017-2020
▪ Dz. U. 2021 poz. 497 - Obwieszczenie Marszałka Sejmu Rzeczypospolitej Polskiej z dnia 23 lutego 2021 r. w sprawie ogłoszenia jednolitego tekstu ustawy o charakterystyce energetycznej budynków	TC 2021	since 2021

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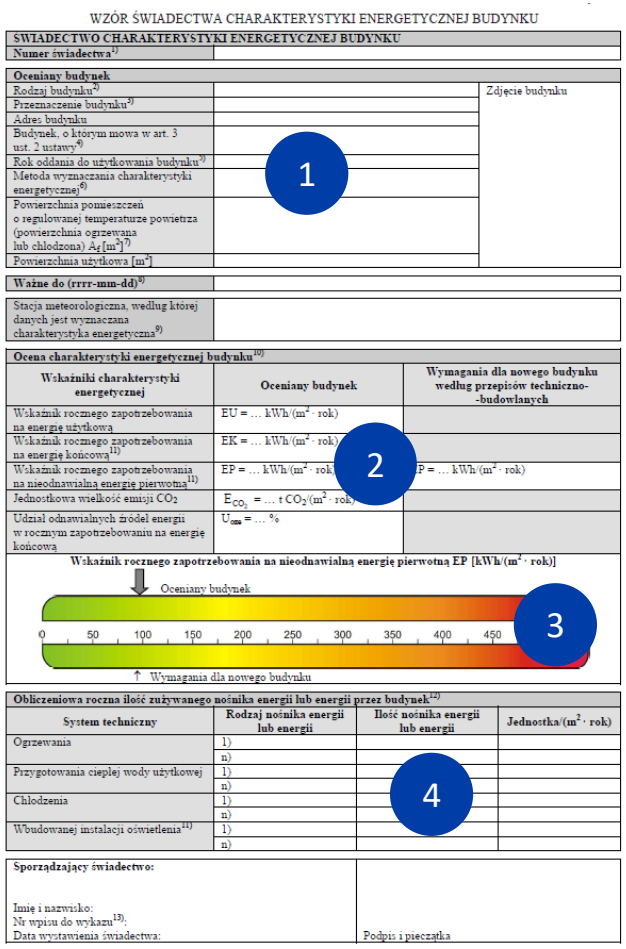
Energy Performance Certificate



WZÓR ŚWIADECTWA CHARAKTERYSTYKI ENERGETYCZNEJ BUDYNKU

ŚWIADECTWO CHARAKTERYSTYKI ENERGETYCZNEJ BUDYNKU

Numer świadectwa[1]

Oceniany budynek

Rodzaj budynku[2]		Zdjęcie budynku
Przeznaczenie budynku[3]		
Adres budynku		
Budynek, o którym mowa w art. 3 ust. 2 ustawy[4]		
Rok oddania do użytkowania budynku[5]		
Metoda wyznaczania charakterystyki energetycznej[6]		
Powierzchnia pomieszczeń o regulowanej temperaturze powietrza (powierzchnia ogrzewana lub chłodzona) A_f [m²][7]		
Powierzchnia użytkowa [m²]		

1

Ważne do (rrrr-mm-dd)[8]

Stacja meteorologiczna, według której danych jest wyznaczana charakterystyka energetyczna[9]

Ocena charakterystyki energetycznej budynku[10]

Wskaźniki charakterystyki energetycznej	Oceniany budynek	Wymagania dla nowego budynku według przepisów techniczno-budowlanych
Wskaźnik rocznego zapotrzebowania na energię użytkową	EU = … kWh/(m² · rok)	
Wskaźnik rocznego zapotrzebowania na energię końcową[11]	EK = … kWh/(m² · rok)	
Wskaźnik rocznego zapotrzebowania na nieodnawialną energię pierwotną[11]	EP = … kWh/(m² · rok)	EP = … kWh/(m² · rok)
Jednostkowa wielkość emisji CO_2	E_{CO_2} = … t CO_2/(m² · rok)	
Udział odnawialnych źródeł energii w rocznym zapotrzebowaniu na energię końcową	U_{ono} = … %	

2

Wskaźnik rocznego zapotrzebowania na nieodnawialną energię pierwotną EP [kWh/(m² · rok)]

Oceniany budynek

0 50 100 150 200 250 300 350 400 450

↑ Wymagania dla nowego budynku

3

Obliczeniowa roczna ilość zużywanego nośnika energii lub energii przez budynek[12]

System techniczny	Rodzaj nośnika energii lub energii	Ilość nośnika energii lub energii	Jednostka/(m² · rok)
Ogrzewania	1)		
	n)		
Przygotowania ciepłej wody użytkowej	1)		
	n)		
Chłodzenia	1)		
	n)		
Wbudowanej instalacji oświetlenia[11]	1)		
	n)		

4

Sporządzający świadectwo:

Imię i nazwisko:
Nr wpisu do wykazu[13]:
Data wystawienia świadectwa:

Podpis i pieczątka

1 General building data (construction year, usable area)

2 Primary & final energy demand

3 Primary energy demand & Requirements for new buildings

4 Calculated energy demand and consumption, seperated in technical systems

- Energy Performance Certificates are mandatory in Poland since 2009 for new buildings and existing buildings undergoing a major renovation and when selling or renting a house
- the share of issued EPCs for the residential buildings stock is estimated to be about 4 – 11%

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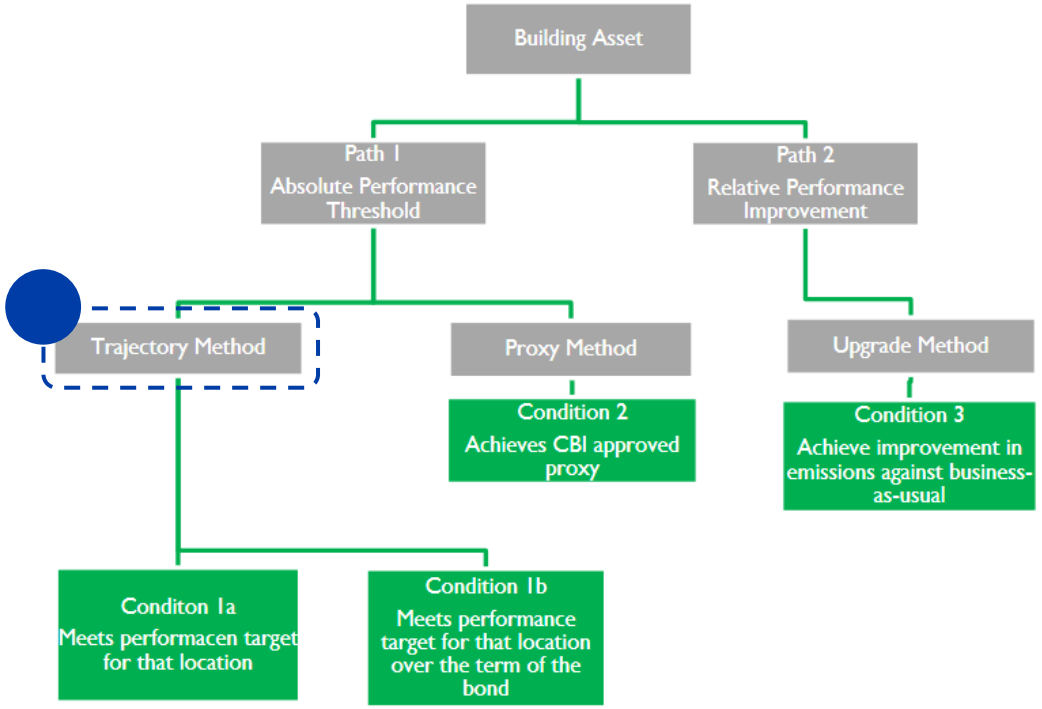
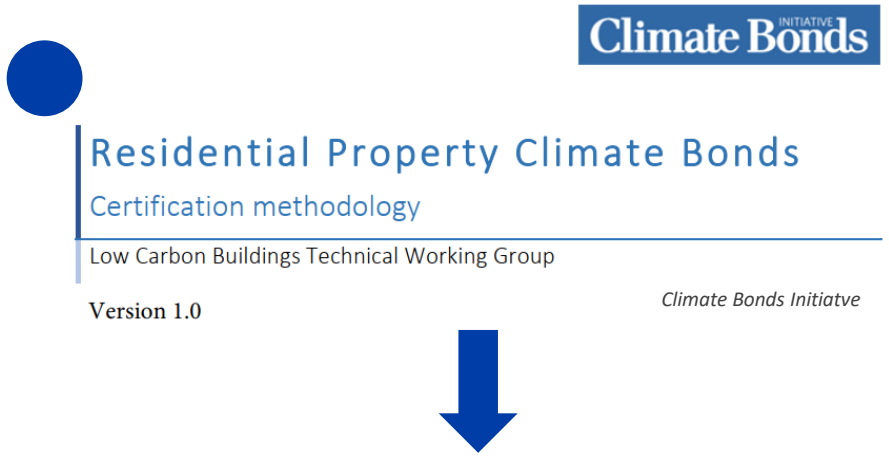
Process & Eligibility – Residential Assets



Climate Bonds Initiatve – Low Carbon Buildings

Low Carbon Buildings (Commercial and **Residential**)

Green Bond asset is within the **Top 15%** of its local market



Method 1: Benchmarking against local market carbon performance

2050 zero-carbon linear trajectory

Method 2: Relative stringency of energy labels and rating tools

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

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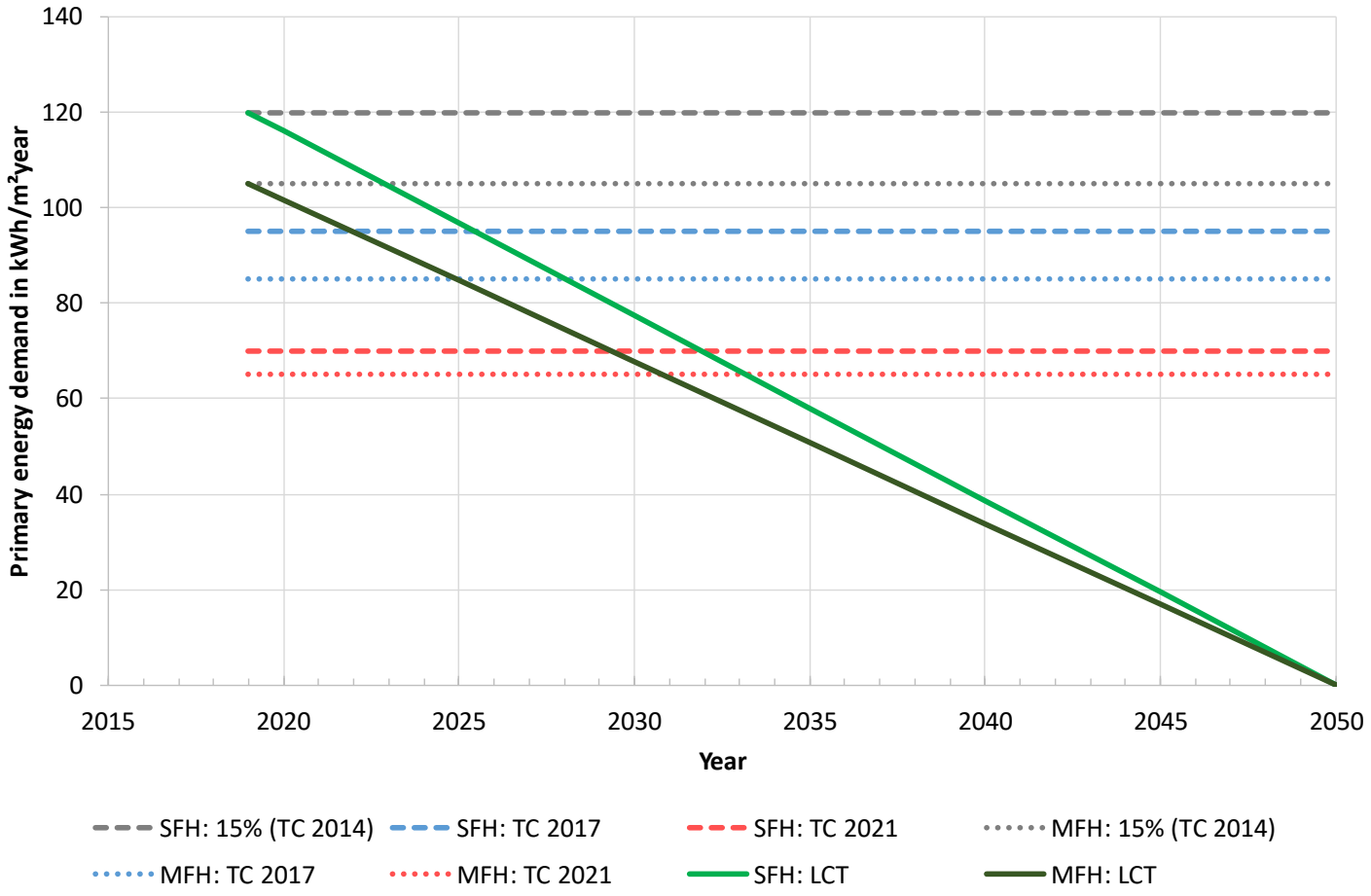
Future primary energy demand requirement – Low carbon trajectories (LCTs)



A **low carbon trajectory (LCT)** connects:

- the basis requirements of TC 2014 (SFH: PE≤ 120 | MFH: PE≤ 105 kWh/m²year) as the start in the year **2019**

towards

- the **Zero-Emission-Goal** in **2050** with zero non-renewable primary energy**.**

The **low carbon trajectories** for **single-** and **multifamily** houses serve as the **15th percentile** baseline for the local polish residential market.

SFH	= Single Family House
MFH	= Multi-Family House
TC	= Technical Condition
LCT	= Low carbon trajectory

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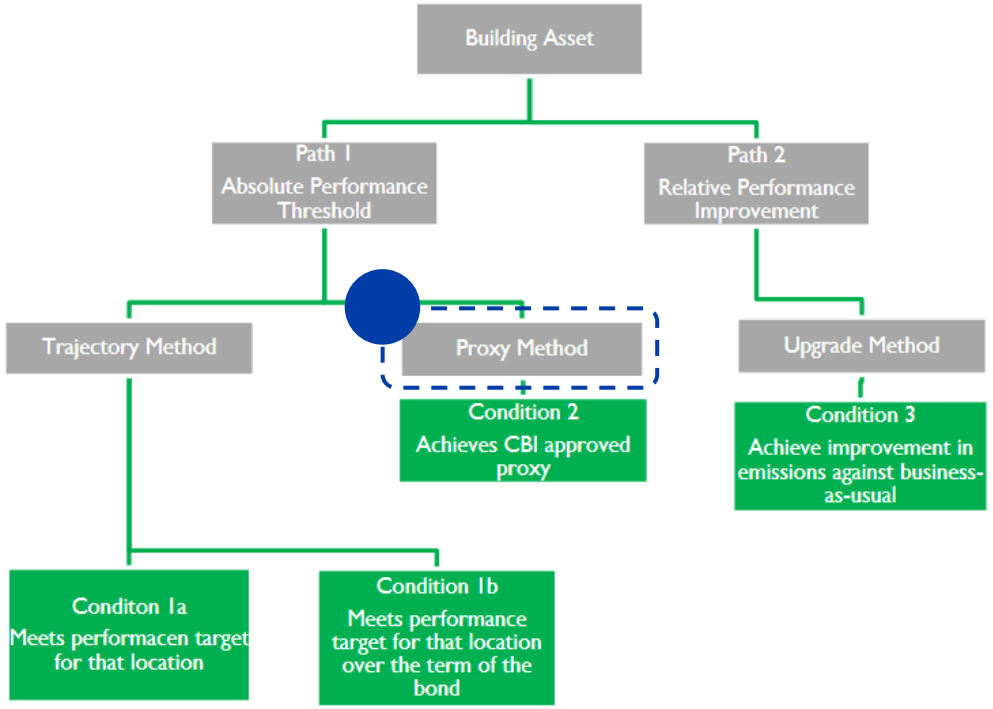
Process – Non-Residential Assets



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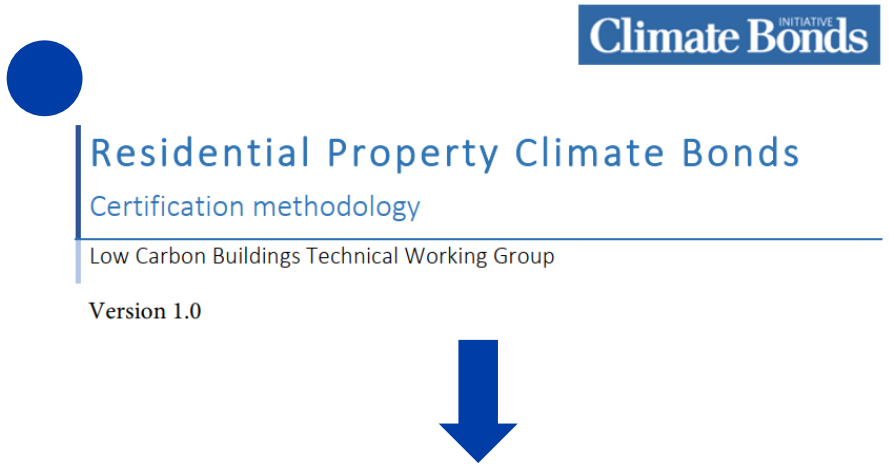
Low Carbon Buildings (Commercial and **Residential**)

Green Bond asset is within the **Top 15 %** of its local market



Method 1: Benchmarking against local market carbon performance

2050 zero-carbon linear trajectory

Method 2: Relative stringency of energy labels and rating tools

- **Identification of a Database,**
- **Confirmation of sufficient sample size, representative Database**
- **Determination of Minimum Criteria**

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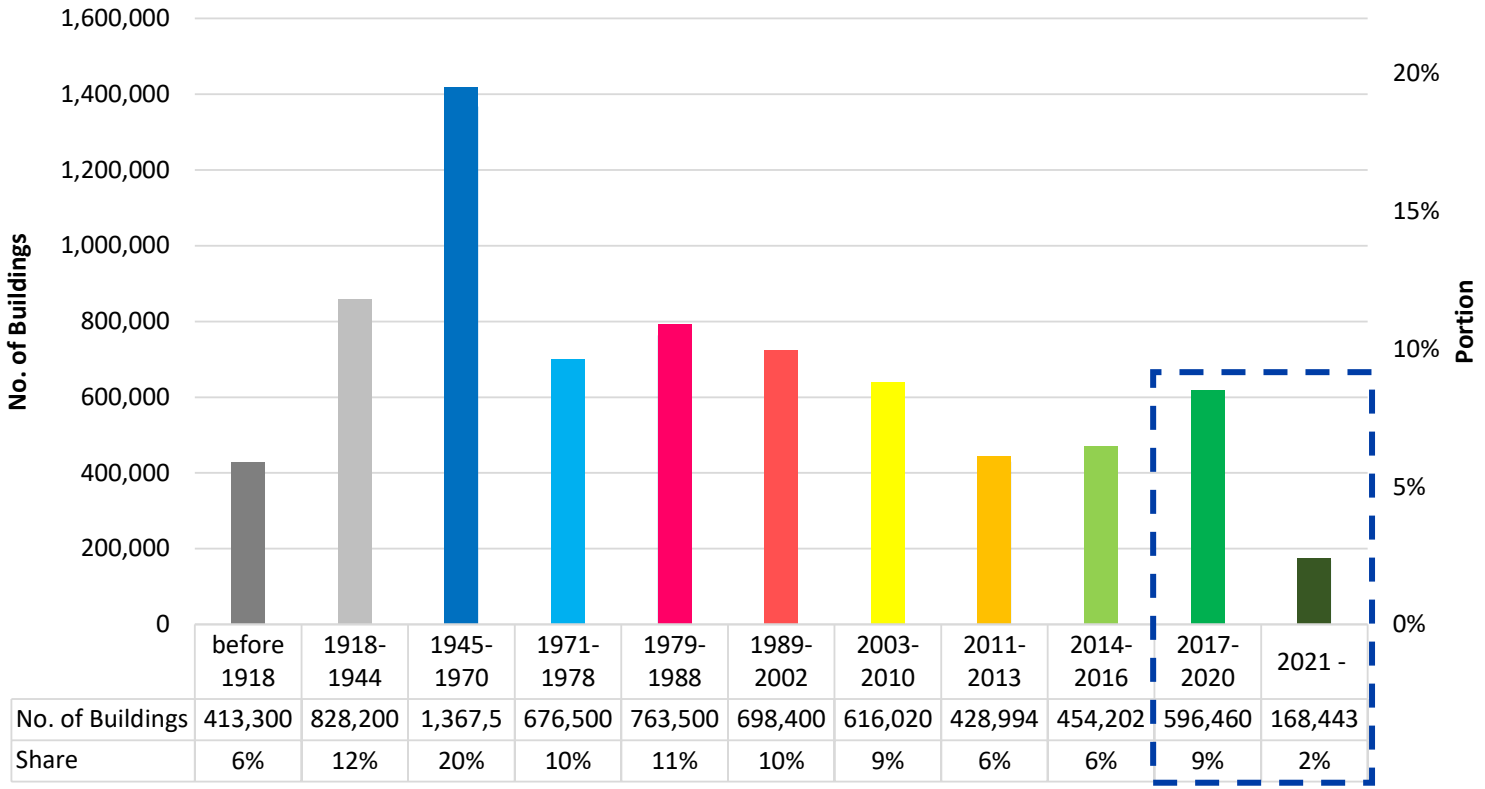
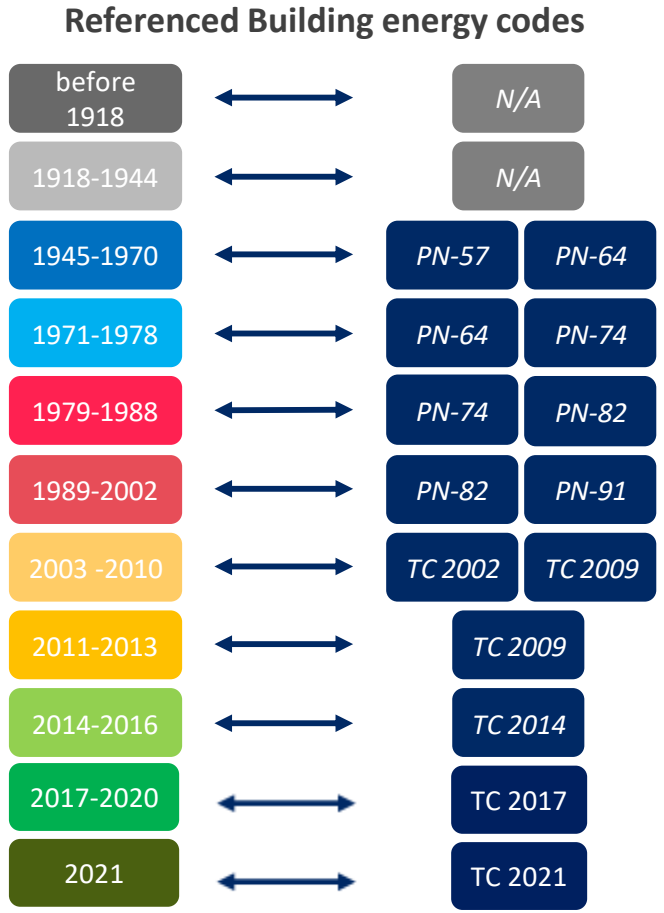
Poland‘s residential building stock and energy building codes



	before 1918	1918-1944	1945-1970	1971-1978	1979-1988	1989-2002	2003-2010	2011-2013	2014-2016	2017-2020	2021 -
No. of Buildings	413,300	828,200	1,367,5	676,500	763,500	698,400	616,020	428,994	454,202	596,460	168,443
Share	6%	12%	20%	10%	11%	10%	9%	6%	6%	9%	2%

Drees & Sommer figure based on Statistics Poland 2022, *TABULA/NAPE 2012, European Commission 2021 and Statista with extrapolated data*



2020: ≈ 7 million residential buildings and ≈ 15 million residential dwellings

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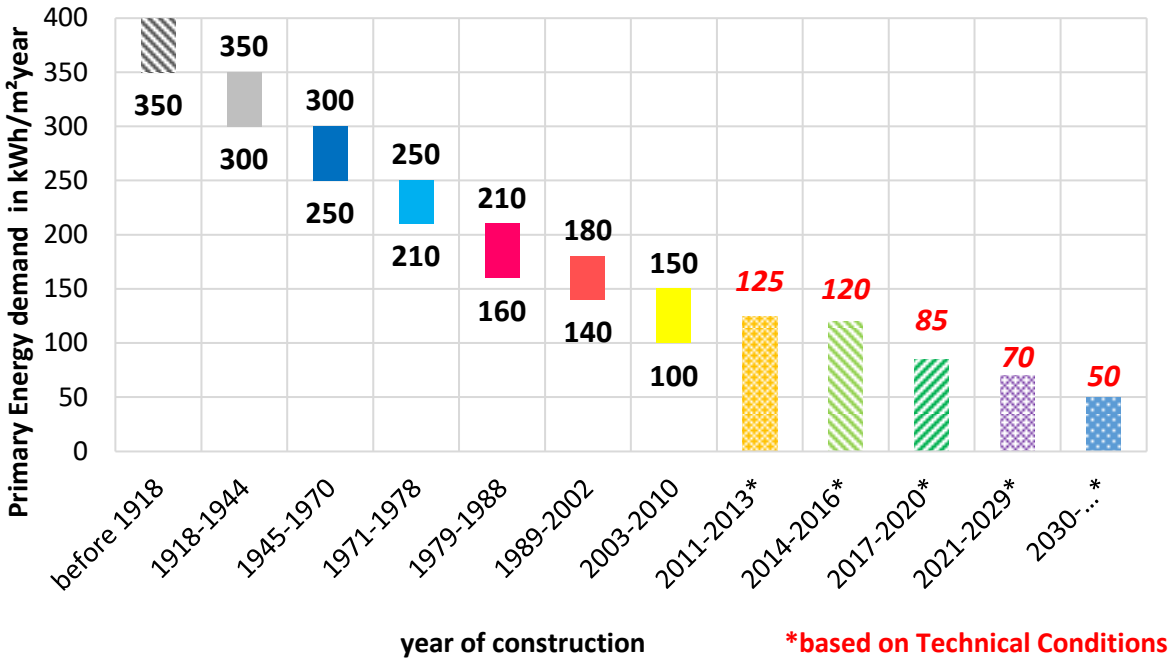
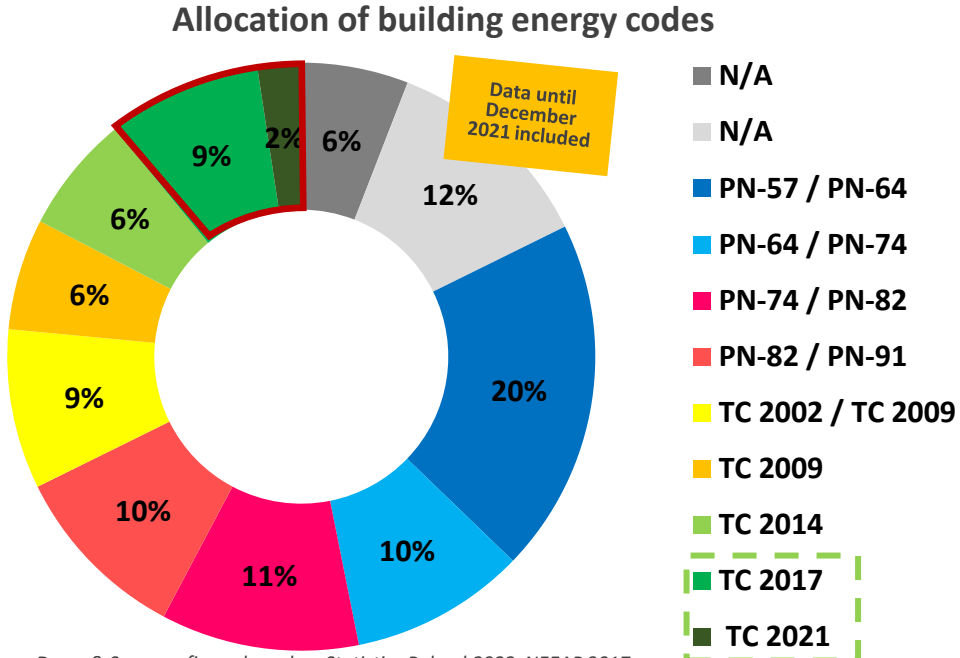
Primary energy demand and allocated building energy codes



Drees & Sommer figure based on Statistics Poland 2022, *TABULA/NAPE 2012, European Commission 2021 and Statista with extrapolated data*



Drees & Sommer figure based on Statistics Poland 2022, NEEAP 2017

eligible for Green Bond

Non-renewable primary energy demand:

- Heating & Cooling
- Hot Water,
- Lighting (excluded for residential buildings),
- processing and delivery of an energy carrier.

Green Bond asset is within the **Top 15%** of its local market, if:

Technical Condition is TC 2017 or newer

*(TC 2014 positions the assets within the top **11%** to **17%** of the local market and does not qualify.)*

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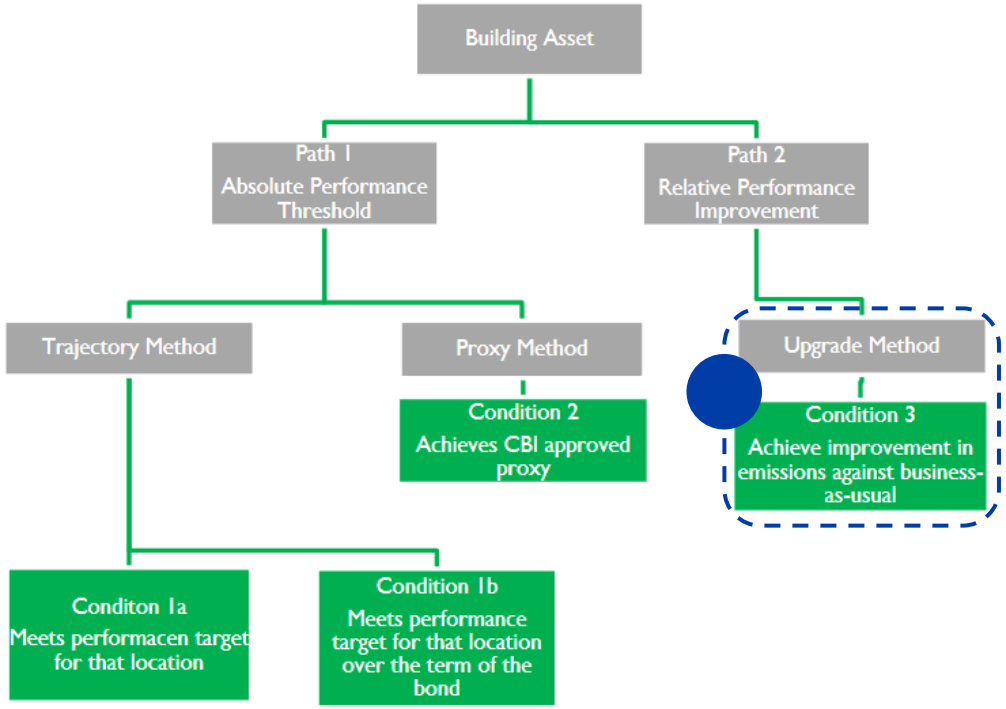
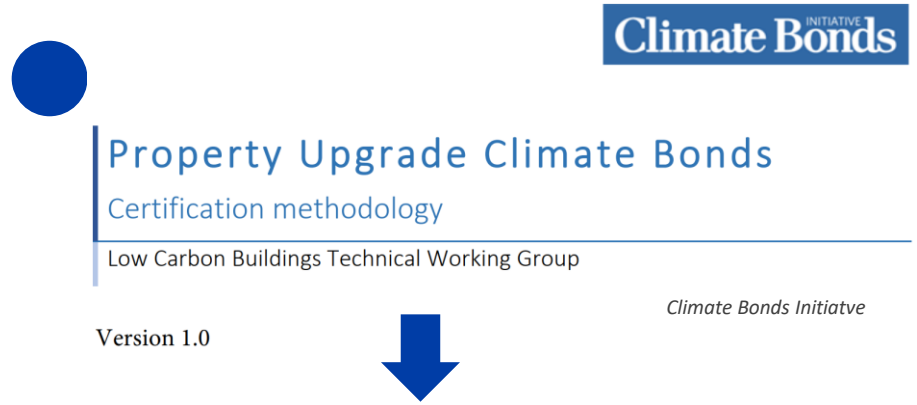
Process & Eligibility – Property Upgrades



Climate Bonds Initiative – Low Carbon Buildings



Property **Upgrade** include assets which undergo or have undergone

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

Green Covered Bond assets require **improvements** which result in reductions of **30% or more** in:

- carbon emissions (non-renewable primary energy)

based on green bond duration

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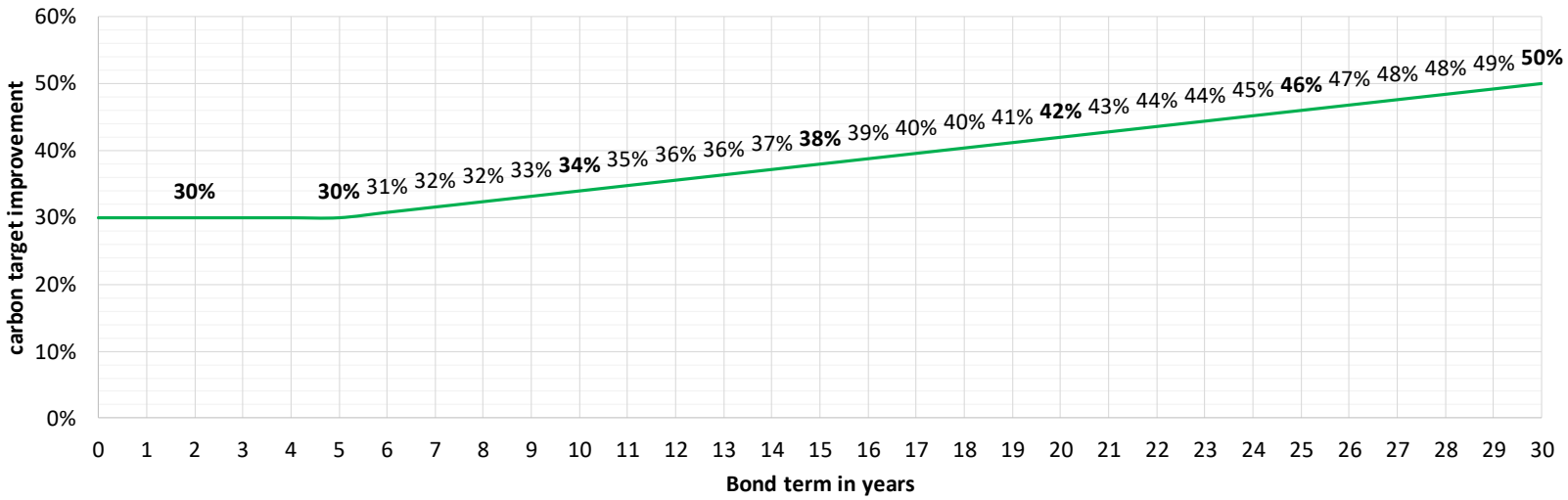
Property Upgrades – carbon emissions improvement



Drees & Sommer figure based on CBI's property upgrade guidance

Green Bond assets require **improvements** which result in reductions of **30% or more** in:

- carbon emissions (based on primary energy savings)

depending on the green bond duration.

Example: Single Family House

Before upgrade:

Year of construction	= 1992
Technical condition	= PN 91
Primary Energy Demand	= 160 kWh/m²year
Carbon Emissions	= 61 tCO2/m²year

After upgrade:

Year of renovation	= 2019
Technical condition	= TC 2017
Primary Energy Demand	= 95 kWh/m²year
Carbon Emissions	= 36 tCO2/m²year

Improvement: ≈ 41%

Eligibility for **Green Bond**: ✓

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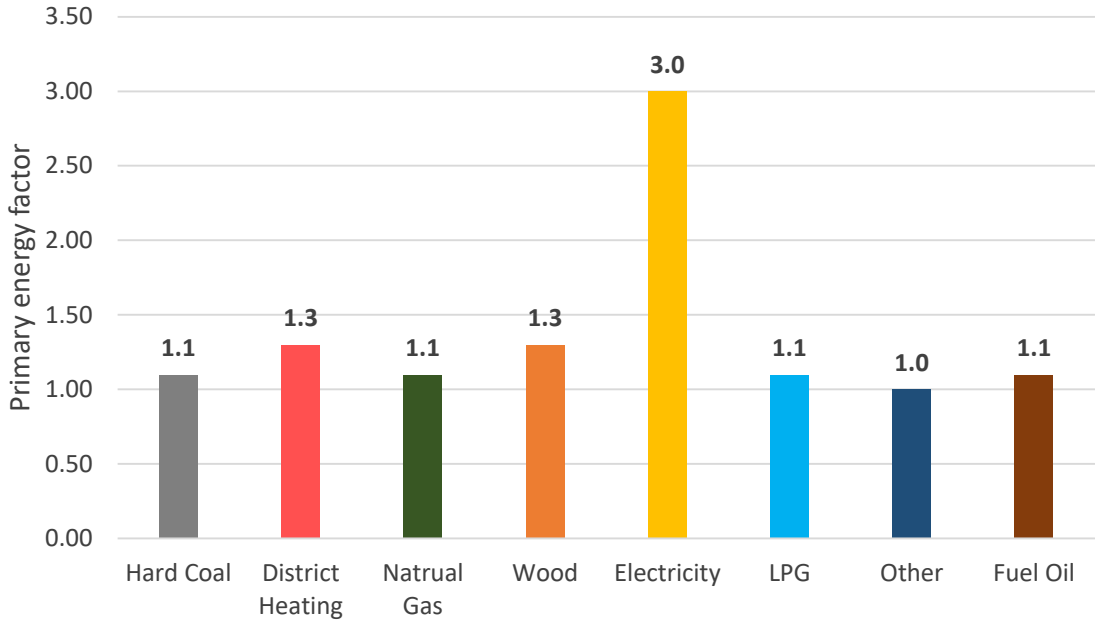
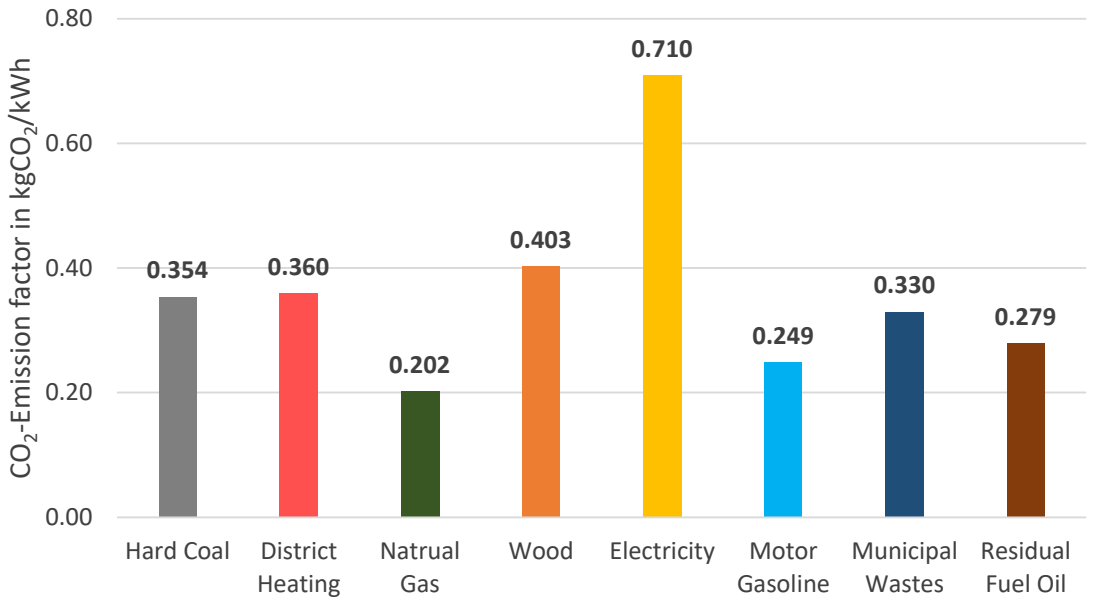
Poland – Primary Energy Factor (PEF) and Carbon Emissions Factors



Drees & Sommer figure based on EPBD & International Institue for Sustainability Analysis and Strategy 2015



Drees & Sommer figure based on IPCC 2006 and European Environment Agency

- PEF and Carbon emission factor are used to calculate national reference benchmarks
- The energy consumption separated into the different sources leads to an average PEF, to calculate the primary energy consumption
- The same calculation with the carbon emission factor results in a carbon intensity and a building stock weighted reference benchmark

ENERGY & CO2-BENCHMARKS

Residential Buildings Poland – Energy consumption and Area

Residential building stock:

End of 2021	SFH	MFH
Number	**7,033,000 units**	
Average area	**134 m²/unit**	**75 m²/unit**
Total area	**1,211 million m²**	

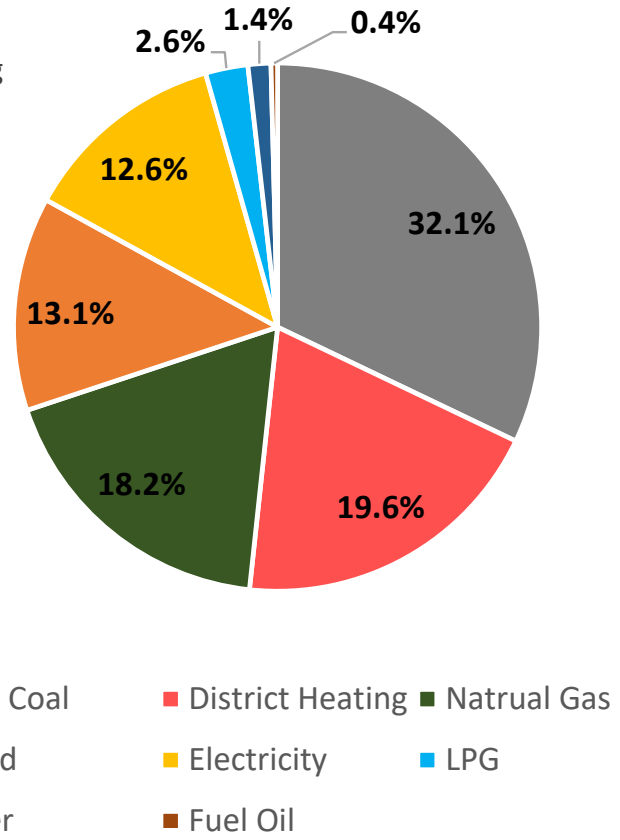
Table based on Statistics Poland 2022, Building Engineering 2021 *and Statista*

- Total end energy consumption and share of heating and warm water to lightning and cooling from Journal of Building Engineering 2021
- Number of buildings and building area from Statistics Poland 2022 and Statista
- Share of energy consumption of Journal of Building Engineering 2021

End energy consumption (2021):

Hard Coal	267,925 TJ	61.5 kWh/m²/a
District Heating	163,593 TJ	37.5 kWh/m²/a
Natrual Gas	151,907 TJ	34.9 kWh/m²/a
Wood	109,340 TJ	25.1 kWh/m²/a
Electricity	105,167 TJ	24.1 kWh/m²/a
LPG	21,701 TJ	5.0 kWh/m²/a
Other	11,685 TJ	2.7 kWh/m²/a
Fuel Oil	3,339 TJ	0.8 kWh/m²/a
Total energy consumption	**834,656 TJ**	**191.5 kWh/m²/a**

Table based on Journal of Building Engineering 2021 *, D&S calculations and assumptions*



Drees and Sommer figure based on Journal of Building Engineering 2021

ENERGY & CO2-BENCHMARKS

Residential Buildings Poland – CO_2-emissions & PEF

Carbon intensity and PEF residential buildings (2021):

Energy type	Share of end energy consumption	CO_2-emission factor	CO_2-intensity heating	PEF	Weighted PEF for heating and warm water
Hard Coal	32.1 %	0.354 $kgCO_2/kWh$	0.375 $kgCO_2/kWh$	1.1	1.403
District Heating	19.6 %	0.360 $kgCO_2/kWh$		1.3	
Natrual Gas	18.2 %	0.202 $kgCO_2/kWh$		1.1	
Wood	13.1 %	0.403 $kgCO_2/kWh$		1.3	
Electricity	12.6 %	0.710 $kgCO_2/kWh$		3.0	
LPG	2.6 %	0.249 $kgCO_2/kWh$		1.1	
Other	1.4 %	0.330 $kgCO_2/kWh$		1.0	
Fuel Oil	0.4 %	0.279 $kgCO_2/kWh$		1.1	

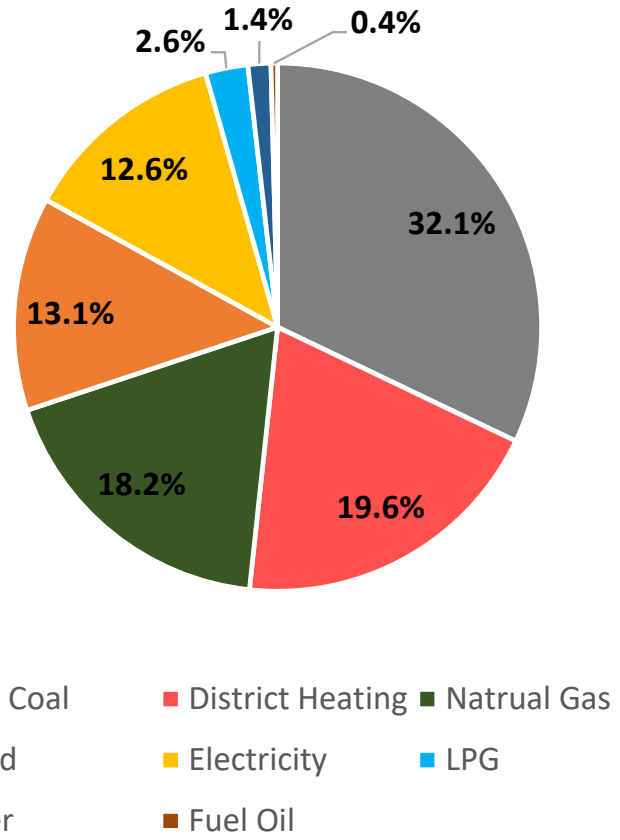
Table based on Journal of Building Engineering 2021 *, D&S calculations and assumptions*

Building weighted national reference benchmark for end energy demand:
- **Ø 191.54 kWh/m²/a**

Primary energy factor:
- **1.403**

CO2-intensity:
0.375 $kgCO_2/kWh$

Building weighted national reference benchmark for CO_2-emissions:
71.83 $kgCO_2/(m^2a)$



Drees and Sommer figure based on Journal of Building Engineering 2021

DREES & SOMMER

SUSTAINABLE FINANCE

Energy & CO2-Benchmarks – residential buildings in Poland

Ø-Reference values: Energy	Ø-Reference values: CO_2	
Building stock weighted reference benchmarks: Final energy: **Ø191.5 kWh/(m²a)** Primary energy factor: **Ø1.403** Primary energy: **Ø268.7 kWh/(m²a)**	Building stock weighted reference benchmark: CO_2-Intensity: **Ø 0.375 kgCO_2/kWh**	Building stock weighted reference benchmark: **71.8** kgCO_2/(m²a)

Source: Drees & Sommer low carbon building benchmarks
Benchmarks are valid for assets located in Poland. Status: May 2022

SUCCESSFUL BUILDINGS

LIVEABLE CITIES

HIGH-YIELD PORTFOLIOS

POWERFUL INFRASTRUCTURE

FUTURE-ORIENTED CONSULTING

DREES & SOMMER