stichting W/E adviseurs

W/E report 32567

Avoided CO_2 emissions Green Bond Portfolio ABN AMRO

Status per 31-12-2023

Stichting W/E adviseurs
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Project
W/E 32567

Content

1 ABN AMRO Green Bond

As requested by ABN AMRO, W/E consultants have calculated the CO_2 impact indication of the assets that are financed by the outstanding ABN AMRO Green Bond portfolio[1] as per 31 December 2023. This report covers the impact calculations of the current ABN AMRO Green Bond portfolio, consisting of multi- and single-family-dwellings (project category A: energy efficient residential buildings), onshore & offshore wind and solar energy (project category B: Renewable energy) and commercial real estate (CRE, project category C).

In this report the carbon impact is calculated per eligible asset category depending on the distribution of allocated assets per 31 December 2023. Core indicators are reported in accordance with the 'The Global GHG Accounting & Reporting Standard for the Financial Industry' of PCAF[2].

1.1 Total financed CO_2-emission ABN AMRO portfolio

The proceeds of the current green bond portfolio are allocated to the residential mortgages (A), renewable projects (B) and the CRE selection project categories of ABN AMRO (C). For each of these categories, the annual avoided CO_2 emissions (for buildings compared to a national benchmark) have been calculated (Table 1). The calculated financed CO_2-emission reduction of the current ABN AMRO green bond portfolio is 542,708 tonnes CO_2 per year[3].

Table 1 Avoided financed CO_2-emissions portfolio ABN AMRO.

		Reduction [tonnes/a]
A	Residential buildings	-36,198
B	Renewable energy	-506,271
C	CRE	-239
TOTAL		**-542,708**

The table on the following page gives a more detailed breakdown of the CO_2 impact per project category.

[1] https://www.abnamro.com/greenbonds, https://assets.ctfassets.net/1u811bvgvthc/2R6dfwtAMVtVjW7mUm8cn0/95c8aaf48008f8088976497a17afe19c/GB_report_20231231.pdf

[2] PCAF (2020). 'The Global GHG Accounting and Reporting Standard for the Financial Industry/part A. Second edition', December 2022, https://carbonaccountingfinancials.com/files/downloads/PCAF-Global-GHG-Standard.pdf

[3] In this report, we use metric tonnes (1,000 kilograms).

Table 2 Reporting table in line with the ICMA Harmonised Framework for Impact Reporting[4].

Green Building Portfolios	Signed amount	Share of Total Project Financing	Eligibility for green bonds	Green Building Component	Allocated Amount	Average Portfolio lifetime	Nett Building Area	#1) Primary Fossil Energy Use			#2 Annual CO2 emissions avoided		
Portfolio name	mln euro	%	% of signed amount	% of signed amount	mln euro	year	in m²	kWh/m²	% of primary fossil energy use avoided	% of renewable energy generated on site	kg CO_2/m²	tonnes of CO_2	% of carbon emissions avoided
multi family houses	2,617	60%	100%	100%	1,566	10+	585,710	119	-44%	N/A	8.5	4,995	-39.9%
single family houses	10,290	66%	100%	100%	6,830	10+	3,434,038	103	-50%	N/A	9.1	31,202	-36.7%
Commerical Real Estate	184	43%	100%	100%	78	1.33	71,100	129	-40%	N/A	3.4	239	-14.0%
Total	**13,090**	**65%**	**100%**	**100%**	**8,474**		**4,090,848**	**106**	**-49%**	**N/A**	**8.9**	**36,437**	**-36.7%**

Renewable Energy (RE)	Signed Amount	Share of total project financing	Eligibility for green bonds	RE component	Allocated amount	Average Portfolio lifetime	#2 Annual generation		#3 Renewable energy capacity added	Renewable energy capacity rehabilitated	#1 Annual CO2 emissions avoided		
							electricity	other					
Portfolio name	mln euro	%	% of signed amount	% of signed amount	mln euro	year	MWh	GJ	MW	MW		tonnes of CO_2	
Wind and solar parks	32,048	3%	100%	100%	892	10+	1,574,489	-	13,898	-		506,271	
Total	**32,048**	**3%**	**100%**	**100%**	**892**		**1,574,489**	**-**	**13,898**	**-**		**506,271**	

Total	Signed amount	Share of Total Project Financing	Eligibility for green bonds		Allocated Amount						Annual CO2 emissions reduced / avoided		
Portfolio name	mln euro	%	% of signed amount		mln euro							tonnes of CO_2	
Total	**45,138**	**21%**	**100%**		**9,366**							**542,708**	

Residential buildings and CRE

The method for calculating the avoided CO_2-emissions of residential buildings and Commercial Real Estate (CRE) is described in paragraph 2.1.

Paragraph 2.2 gives the calculated CO_2-emissions of the energy efficient residential buildings within the ABN AMRO Green Building Portfolio. The calculated emissions are compared to the associated benchmark CO_2-emissions in paragraph 2.3. The Primary Fossil Energy Use as reported in Table 2 is calculated in a similar way, using Primary Fossil Energy Use numbers per energy label category.

Paragraph 4.1 gives the calculated CO_2-emissions of the CRE in the ABN AMRO Green Building portfolio. The calculated emissions are compared to the associated benchmark CO_2-emissions in paragraph 4.2.

The PCAF CO_2 coefficients and the distribution of the m^2 useful floor area of the average buildings in the Netherlands that are used as bases for the calculations for can be found in the Annex (5.1).

Renewable energy

The emissions of the financed solar and wind energy projects are calculated in chapter 3 (Project category B Renewable Energy – wind and solar parks).

1.2 Characteristics ABN AMRO portfolio

The characteristics of the three categories are given in Table 3 (A. residential buildings), Table 4 (B. Renewable Energy) and Table 5 (C. CRE).

Table 3 Project category A: Energy efficient residential buildings.

Use function	number of property units[5]	useful floor area [m²]	property value [mln. €]	current loan [mln. €]
Multi-family dwellings	5,574	585,710	2,617	1,566
Single-family dwellings	20,943	3,434,038	10,290	6,830
Total residential	**26,518**	**4,019,748**	**12,906**	**8,396**

[4] https://www.icmagroup.org/sustainable-finance/impact-reporting/green-projects/

[5] In Dutch: 'verblijfsobject'.

Table 4 Project category B Renewable Energy – Wind and solar parks.

Number of wind and solar projects	28
Total project amount (debt + equity) (mln. €)	32,048
Current drawn exposure / Outstanding amount (mln. €)	**892**
Share outstanding amount in total project amount	2.8%

Table 5 Project category C: Commercial real estate (CRE).

Use function	number of property units	useful floor area [m²]	property value [mln. €]	current loan [mln. €]
Office	1	12,684	6	4
Shop	2	19,283	68	42
Multi-family dwellings	8	37,321	108	32
Healthcare	2	1,812	0.8	0.2
Total CRE	**13**	**71,100**	**184**	**78**

2 Project category A Energy efficient residential buildings

2.1 Calculation method CO_2-emission buildings

The method for calculating the financed CO_2 emissions is derived from chapters '5.4 Commercial real estate' and '5.5 mortgages' of the PCAF publication[6].

The following calculations are made:

- The CO_2-emissions of the buildings in the ABN AMRO portfolio.
- The financed CO_2-emissions of these buildings. This is the calculated CO_2-emission per building multiplied by the attribution factor.
- Avoided emissions: The comparison of the (financed) CO_2-emissions to the benchmark, the average CO_2-emisions of a comparable set of Dutch buildings.

The annual CO_2-emission is calculated using CO_2 coefficients per use function per energy label G-A^{++++} (tonnes/m^2.a; see Table 18 in the Annex, taken from the PCAF database[7]) and the relevant data for all buildings in the ABN AMRO portfolio: use function (office, shop, dwellings), useful floor area [m^2] and the energy label. See formula [1] in the Annex.

The financed CO_2-emissions, as calculated according to formula [3] in the Annex, include the attribution factor in the calculations. The attribution factor is the ratio between the outstanding loan amount (in the data set used: gross carrying amount) and the property value at origination (in the data set used: property value at increase, or if not available, the originally registered market value), as calculated in formula [2] in the Annex. Per building the calculated CO_2-emisison is multiplied by the attribution factor of that building.

To compare the calculated CO_2-emissions to a benchmark, the same CO_2 coefficient per energy label [tonnes/m^2.a] per use function is used and applied to the benchmark distribution. For the residential benchmark, the energy label distributions (expressed in a percentage of the total of useful floor area) of both single-family and multi-family dwellings are calculated from EP-online[8]. The average set of other use functions in the Netherlands is derived from the calibration for new energy labels of utility buildings in the Netherlands[9]. The corresponding energy labels of these dwellings have been calculated with NTA 8800:2022[10].

The calculations of the (financed) CO_2-emission reduction of the buildings in the ABN AMRO portfolio compared to the benchmark are made per building and then summed up per use function and then to a total.

Step-by-step

Calculations are made per building and then summed per use function and then total.

1. Collect the following data for all buildings in the ABN AMRO portfolio:
   - Use function[11]
   - Outstanding amount [euro]
   - Property value at origination [euro]

[6] Financed Emissions, The global GHG accounting & reporting Standard, part A, PCAF, 2022

[7] https://carbonaccountingfinancials.com/en/newsitem/financing-towards-net-zero-buildings-pcaf-launches-updated-european-building-emission-factor-database

[8] EP-online: database October 2023

[9] Inijkingsstudie energielabels utiliteitsgebouwen, 2020: https://www.rijksoverheid.nl/documenten/publicaties/2020/04/29/advies-klassenindeling-energielabel-op-basis-van-nta-8800-voor-woningen-en-utiliteitsgebouwen

[10] NTA 8800 https://www.nen.nl/nta-8800-2022-nl-290717

[11] In Dutch: 'gebruiksfunctie'

- Attribution factor [%]
- Energy label
- Useful floor area [m^2]

2. Collect the CO_2 coefficients per m^2 useful floor area, per energy label from the PCAF website.
3. Use data from the first steps and the formulas of paragraph 5.3 in the Annex to calculate the CO_2-emission of the buildings in the ABN AMRO portfolio (results in chapter 2.2).
4. Calculate the average CO_2 coefficient [tonnes/m^2.a] per use function in the Netherlands using the average distribution of the m^2 useful floor area per energy label in the Netherlands and the PCAF CO_2 coefficients per use function and energy label. The average distribution of useful floor area over the energy labels comes from WoON2018 (dwellings) and the calibration for new energy labels of utility buildings in the Netherlands (other use functions).
5. Calculate the benchmark CO_2-emission per building, using the useful floor area of the building and the calculated average CO_2 coefficient for the corresponding use function. See paragraph 2.3.
6. Sum up all the calculated (financed) CO_2-emissions per building to the CO_2-emissions per use function and the total CO_2-emission.
7. The reduction is calculated to subtract the CO_2-emissions for the ABN AMRO portfolio from the CO_2-emissions of the average building set.

2.2 CO_2-emission residential buildings

The CO_2 emission of the residential buildings is calculated using data provided by ABN AMRO.

The calculation follows the method described in the previous chapter.

The distribution of useful floor area[12] in m^2 per use function and per energy label is given in Table 6. This format allows for an easy way of calculating the CO_2-emission, using the CO_2-emission per m^2 in Table 18 in the Annex.

Table 6 Total useful floor area per use function and energy label for residential buildings [m^2].

Use function	A++++	A+++	A++	A+	A	Total
Multi-family	4,079	159,846	37,323	20,429	364,033	585,710
Single-family	55,231	760,894	80,643	58,237	2,479,034	3,434,038
Total residential	**59,310**	**920,739**	**117,966**	**78,666**	**2,843,067**	**4,019,748**

Table 7 gives the calculated CO_2 emissions of all buildings using the data from Table 6 (useful floor area in m^2) and Table 18 (CO_2 coefficient in tonnes/m^2.a).

Table 7 CO_2-emission for energy efficient residential buildings [tonnes/a].

Use function	A++++	A+++	A++	A+	A	Total
Multi-family	0	943	549	433	11,321	13,246
Single-family	0	4,413	1,169	1,211	76,106	82,900
Total residential	**0**	**5,356**	**1,718**	**1,644**	**87,428**	**96,146**

[12] In Dutch 'gebruiksoppervlakte'

Table 8 gives the financed CO_2-emission of the energy efficient residential buildings, which is calculated by multiplying the previously calculated CO_2-emission per residential building by the given attribution factor per building.

Table 8 Financed CO_2-emission for energy efficient residential buildings [tonnes/a].

Use function	A++++	A+++	A++	A+	A	Total
Multi-family	0	623	350	287	6,271	7,531
Single-family	0	3,111	791	844	49,064	53,810
Total residential	**0**	**3,734**	**1,141**	**1,130**	**55,335**	**61,341**

2.3 CO_2-emission compared to NL benchmark

The CO_2-emissions of the residential buildings in the ABN AMRO portfolio are compared with the average CO_2-emissions of residential buildings in the Netherlands, the associated benchmark. Calculations are made per building and then summed per use function and then for all residential buildings.

Table 9 gives the CO_2-emission compared to the Dutch benchmark.

Table 10 gives the financed CO_2-emission compared to the Dutch benchmark.

The basic principle of calculating the Dutch average CO_2-emissions is the same as used for the ABN AMRO portfolio (formula [1] in the Annex). The deciding parameters are the distribution of useful floor area of Dutch buildings per use function over the energy labels and the CO_2 coefficients per use function and energy label in the PCAF database.

In the Annex data are given of the distribution of useful floor area and the Dutch average CO_2 coefficients per use function (see Table 18 and Table 20. Combining these tables gives the average CO_2-emission per m^2 per use function, Table 21 in the Annex.

For comparing the financed CO_2-emission of the buildings in the ABN AMRO portfolio to the benchmark, the calculated 'average' CO_2-emission per building is multiplied by the attribution factor per building (formulas [1], [3]).

Table 9 CO_2-emission of the residential buildings in the ABN AMRO portfolio, compared to a Dutch equivalent building stock with average CO_2 coefficients.

Use function	ABN AMRO CO_2-emission [tonnes/a]	Benchmark CO_2-emission [tonnes/a]	Reduction CO_2-emission [tonnes/a]
Multi-family	13,246	21,139	-7,892
Single-family	82,900	128,718	-45,818
Total residential	**96,146**	**149,857**	**-53,710**

Table 10 CO_2-emission reduction of the financed part of the residential buildings in the ABN AMRO portfolio compared to an equivalent Dutch average building stock.

Use function	ABN AMRO CO_2-emission [tonnes/a]	Benchmark CO_2-emission [tonnes/a]	Reduction CO_2-emission [tonnes/a]	Reduction CO_2-emission [%]
Multi-family	7,531	12,526	-4,995	-39.9%
Single-family	53,810	85,013	-31,202	-36.7%
Total residential	**61,341**	**97,539**	**-36,198**	**-37.1%**

3 Project category B Renewable Energy – wind and solar parks

Environmental aspects of wind turbine generators and solar systems used

On 1 January 2024, Green Bond proceeds were allocated to 28 project finance loans for solar panels, onshore and offshore wind farms with a total outstanding amount of € 891,719,708.

3.1 Methodology

In accordance to the PCAF guidelines, the P50 value of the expected annual energy yield is taken into account. The P50 value is the predicted annual production for which there is a 50% probability that it will be exceeded in a given year.

The installed power and P50 value for each of the loans is reported in technical due diligence reports, drafted by the Lenders Technical Advisors.

For each of the projects, the total construction capital expenditures (CAPEX) is known as well. As ABN AMRO only provides part of the financing, the ABN AMRO share in the CAPEX is used to calculate the energy yield and avoided CO_2-emissions to be allocated to the Green Bond.

3.2 Impact indicator 1: Total energy production of wind and solar installed

The combined P50-values for the 28 renewable projects is 50,940 GWh/a.

Over the total expected life span of the solar panels and wind mills of 25 years, the total predicted electricity production will be 1,273,493 GWh.

The ABN AMRO share in the CAPEX of the project is on average 2.8%, resulting in 1,574 GWh/a to be allocated to these green bonds.

Table 11 Energy production wind turbines.

Number of renewable projects	28
Share in CAPEX of project	2.8%
Combined P50-values (GWh/a)	50,940
Combined P50-values (GWh in 25 years)	1,273,493
Combined P50-values ABN AMRO share (GWh/a)	1,574

3.3 Impact indicator 2: Avoidance of CO_2 emissions related to these loans

For international financial institutions (IFI), a list of harmonized GHG accounting standards and guidelines has been developed[13]. The avoidance of CO_2 emissions is calculated on the basis of the calculated electricity production per year and the Default Emission Factors (DEFs) of the country's electricity grid where the project is located.

[13] https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting/ifi-twg-list-of-methodologies

The "Methodological Approach for the Common Default Grid Emission Factor Dataset" describes the common dataset maintained by the IFI Technical Working Group (IFI TWG) on GHG accounting, containing the DEFs[14]. The common dataset containing DEFs is constructed using a Combined Margin (CM) for the grid that is comprised of an Operating Margin (OM) and a Build Margin (BM).

For renewable energy projects, the guidance is followed contained in "AHSA-001: IFI Approach to GHG Accounting for Renewable Energy Projects"[15]. In this guideline the approach for the calculation is given: the electricity output from renewable energy projects is multiplied by the Combined Margin (CM) emissions factor in tCO_2e/MWh or equivalent. The common dataset combines the Operating Margin (OM) and the Build Margin (BM) into a CM, using a specific weighting for variable generation (e.g. wind and solar PV). This weighting is 75% OM: 25% BM. The CM data in the most recent version, "Harmonized IFI Default Grid Factors 2021 v3.2" has been used in this report[16].

For each project in the renewable energy portfolio, the Combined Margin Grid Emission Factor of the country of the project location is used in the calculation.

The total avoided CO_2-emissions due to the solar and wind farms within this bond (ABN AMRO share) are 506,271 tonnes per year. Over the lifespan of 25 years, the avoided CO_2-emissions are approx. 12.7 million tonnes. The specific CO_2-emission factors of the countries' electricity grids will likely further decline in the future. However, estimates for this development for the next 25 years are not available in the methodology. Therefore we did not take these developments into consideration. The current numbers for the specific CO_2-emissions are used to calculate the avoided CO_2-emissions for the next 25 years.

[14] https://unfccc.int/sites/default/files/resource/IFITWG_Methodological_approach_to_common_dataset.pdf

[15] https://unfccc.int/sites/default/files/resource/Renewable%20Energy_GHG%20accounting%20approach.pdf

[16] https://unfccc.int/sites/default/files/resource/Harmonized_IFI_Default_Grid_Factors_2021_v3.2_0.xlsx

Table 12 Installed capacity, electricity production (P50) and avoided CO_2 emission of the wind and solar projects, plus the total project amount (debt+equity) and the ABN AMRO current drawn exposure (outstanding amount), that results in the ABN AMRO share.

Nr	capacity	Project amount	current drawn exposure	share	P50	P50 ABN AMRO	avoided CO_2	avoided CO_2 ABN AMRO
	MW	mln €	mln €	%	GWh/a	GWh/a	tonnes/a	tonnes/a
1	736	601	92	15.3%	1,373	210	452,070	69,242
2	42	86	16	19.0%	55	10	18,703	3,559
3	175	212	37	17.7%	579	102	30,100	5,318
4	732	1,405	49	3.5%	2,751	96	770,039	26,941
5	900	1,226	59	4.8%	3,889	186	2,035,403	97,499
6	288	724	56	7.8%	1,204	94	337,102	26,271
7	1,200	3,632	19	0.5%	5,998	32	1,917,646	10,183
8	1,200	3,602	17	0.5%	6,037	28	1,930,146	8,984
9	1,200	3,824	27	0.7%	5,736	40	1,833,709	12,898
10	20	12	10	82.5%	21	17	5,840	4,817
11	1,200	4,522	20	0.5%	5,755	26	1,635,790	7,391
12	50	458	42	9.3%	131	12	41,802	3,874
13	332	1,288	19	1.5%	1,231	18	644,290	9,623
14	370	1,145	24	2.1%	1,679	35	342,260	7,191
15	50	34	27	79.3%	49	39	13,603	10,784
16	605	472	0	0.0%	1,173	0	386,238	83
17	1,140	3,532	55	1.6%	4,809	75	1,537,416	24,119
18	207	331	45	13.7%	781	107	218,708	29,898
19	383	838	40	4.8%	1,511	72	422,917	20,270
20	24	21	18	84.3%	44	37	12,175	10,268
21	86	217	9	4.0%	305	12	85,367	3,393
22	22	24	13	53.8%	20	11	5,542	2,982
23	60	36	28	77.8%	55	43	15,500	12,056
24	2,130	2,120	95	4.5%	3,605	162	1,184,916	53,325
25	467	369	5	1.3%	85	1	28,060	361
26	13	9	7	73.0%	13	9	3,583	2,617
27	448	779	32	4.1%	965	40	299,471	12,412
28	242	529	28	5.3%	1,086	57	568,588	29,911
TOTAL	**13,898**	**32,048**	**892**	**2.8%**	**50,940**	**1,574**	**16,776,983**	**506,271**

4 Project category C Commercial Real Estate (CRE)

The method for calculating the CO_2-emission of the CRE is given in paragraph 2.1.

4.1 CO_2-emission Commercial Real Estate (CRE)

The CO_2 emission of commercial real estate (CRE) is calculated using data provided by ABN AMRO. Energy label, useful floor area and use function were connected to the objects on the CRE list by using information from the Dutch energy label database.

In a specific group of objects, it was, for a small number of utility objects, not possible to retrieve the required parameters. For part of these objects, parameters were either assumed, or the objects were left out from the calculation and from this report, similar to the reporting in 2023. Different use functions were allocated to two other objects that have a 'Gathering' use function[17]. They changed into 'Retail' and 'Healthcare', as it is currently not possible to do the CO_2 and Primary Fossil Energy Use calculations for the 'Gathering' use function. For the residential objects that were not yet entered in the energy label database, numbers for useful floor area were provided and an energy label A++ was used, resulting from conservative judgement by ABN AMRO. In case the number of units per object in the CRE list was lower than the number of units found in the energy label database, the numbers for each energy label category were scaled down similarly.

The calculation follows the method described in the previous chapter.

The distribution of useful floor area[18] in m^2 per use function and per energy label is given in Table 13. This format allows for an easy way of calculating the CO_2-emission, using the CO_2-emission per m^2 in Table 18 in the Annex.

Table 13 Useful floor area per use function | energy label for CRE [m^2].

Use function	A+++	A++	A+	A	Total
Office				12,684	12,684
Retail	307			18,976	19,283
Multi-family dwellings	12,903	24,283	136		37,321
Healthcare	1,812				1,812
Total CRE	**15,021**	**24,283**	**136**	**31,660**	**71,100**

Table 14 gives the calculated CO_2 emissions of the CRE using the data from Table 13 (useful floor area in m^2) and Table 18 (CO_2 coefficient in tonnes/m^2.a).

[17] In Dutch 'bijeenkomstfunctie'

[18] In Dutch 'gebruiksoppervlakte'

Table 14 CO_2-emission the CRE within ABN AMRO portfolio [tonnes/a]

Use function	A+++	A++	A+	A	Total
Office				630	630
Retail	8			1,482	1,490
Multi-family dwellings	76	357	3		436
Healthcare	50				50
Total CRE	**135**	**357**	**3**	**2,112**	**2,607**

Table 15 gives the financed CO_2-emission of the CRE, which is calculated by multiplying the previously calculated CO_2-emission per CRE by the given attribution factor per building.

Table 15 CO_2-emission of financed part of the CRE within ABN AMRO portfolio [tonnes/a].

Use function	A+++	A++	A+	A	Total
Office				405	405
Retail	2			914	916
Multi-family dwellings	23	106	1		129
Healthcare	15				15
Total CRE	**40**	**106**	**1**	**1,318**	**1,465**

4.2 CO_2-emission compared to NL benchmark

The CO_2-emissions of the CRE in the ABN AMRO portfolio are compared to the average CO_2-emissions of CRE in the Netherlands, the associated benchmark. Calculations are made per building and then summed per use function and then for all CRE.

For comparing the financed CO_2-emission of the buildings in the ABN AMRO portfolio to the benchmark, the calculated 'average' CO_2-emission per building is multiplied by the attribution factor per building (formulas [1], [3]).

Table 16 gives the CO_2-emission compared to the Dutch benchmark.

Table 17 gives the financed CO_2-emission compared to the Dutch benchmark and the corresponding reduction percentage.

The basic principle of calculating the Dutch average CO_2-emissions is the same as used for the ABN AMRO portfolio (formula [1] in Annex 5.3). The deciding parameters are the distribution of useful floor area of Dutch buildings per use function over the energy labels and the CO_2 coefficients per use function and energy label in the PCAF data.

In the Annex data are given of the distribution of useful floor area and the Dutch average CO_2 coefficients per use function (see Table 18 and Table 20. Combining these tables gives the average CO_2-emission per m^2 per use function, Table 21 in the Annex.

For comparing the financed CO_2-emission of the buildings in the ABN AMRO portfolio to the benchmark, the calculated 'average' CO_2-emission per building is multiplied by the attribution factor per building (formulas [1], [3]).

Table 16 CO_2-emission of the CRE in the ABN AMRO portfolio, compared to a Dutch equivalent building stock with an average CO_2 emission.

Use function	ABN AMRO CO_2-emission [tonnes/a]	Benchmark CO_2-emission [tonnes/a]	Reduction CO_2-emission [tonnes/a]
Office	630	710	-79
Retail	1,490	1,305	+185
Multi-family dwellings	436	1,347	-911
Healthcare	50	173	-122
Total CRE	**2,607**	**3,535**	**-928**

Table 17 CO_2-emission of the financed part of the CRE in the ABN AMRO portfolio compared to a Dutch equivalent average building stock.

Use function	ABN AMRO CO_2-emission [tonnes/a]	Benchmark CO_2-emission [tonnes/a]	Reduction CO_2-emission [tonnes/a]	Reduction CO_2-emission [%]
Office	405	455	-51	-11.2%
Retail	916	798	+118	+14.8%
Multi-family dwellings	129	399	-270	-67.6%
Healthcare	15	51	-36	-70.8%
Total CRE	**1,465**	**1,704**	**-239**	**-14.0%**

5 Annex

5.1 CO_2-coefficients PCAF

PCAF has CO_2-emissions available for commercial real estate classes (use function) per energy label.

Table 18 CO_2 coefficients on PCAF website[19] (download in Feb 2024) [tonnes CO_2/m^2a].

	Single-family dwellings	Multi-family dwellings	Healthcare	Office	Retail
A++++	0	0	0.0093	0.0058	0.0089
A+++	0.0058	0.0059	0.0278	0.0175	0.0268
A++	0.0145	0.0147	0.0463	0.0292	0.0446
A+	0.0208	0.0212	0.0649	0.0409	0.0625
A	0.0307	0.0311	0.0810	0.0497	0.0781
B	0.0405	0.0411	0.0920	0.0555	0.0892
C	0.0510	0.0517	0.1023	0.0621	0.0996
D	0.0625	0.0635	0.1154	0.0694	0.1115
E	0.0724	0.0734	0.1284	0.0767	0.1234
F	0.0828	0.0840	0.1408	0.0840	0.1353
G	0.0932	0.0946	0.1531	0.0913	0.1472

PCAF also provides Combined Margin Grid Emission factors per country for intermittent energy (e.g. solar, wind, tidal), as listed in the table below.

Table 19 Combined Margin (CM) Grid Emission factors per country (gCO_2/kWh).

Country	CM factor [gCO_2/kWh]
Belgium	204
Denmark	284
Germany	523
Italy	343
Netherlands	280
Portugal	329
Spain	329
Sweden	52
United Kingdom	320

5.2 Distribution m^2 useful floor area over energy labels & CO_2 coefficient NL

Table 20 The current distribution of m^2 useful floor area per use function over the energy labels in the Netherlands [% per use function]. Sources are EP-online (update October 2023)

[19] https://building-db.carbonaccountingfinancials.com/

(single-family dwellings and multi-family dwellings) and the calibration study[20] for energy labels (non-residential).

CRE	A++++	A+++	A++	A+	A	B	C	D	E	F	G
Office	0.1%	3.5%	13.9%	9.5%	20.9%	11.1%	12.6%	9.2%	4.9%	3.4%	11.0%
Retail	0.3%	11.1%	31.9%	15.5%	14.5%	7.0%	6.6%	4.5%	3.1%	2.3%	3.2%
Multi-family dwellings	1.1%	13.3%	9.3%	8.9%	23.6%	12.4%	16.8%	5.9%	3.6%	2.2%	2.9%
Single-family dwellings	4.6%	17.3%	3.3%	4.5%	17.6%	13.7%	20.3%	7.4%	5.1%	3.0%	3.2%

Combining Table 18 and Table 20 gives the average CO_2-emission per m^2 per use function.

Table 21 Average CO_2-emission per use function [tonnes/m^2.a].

Use function	CO_2-emission [tonnes/m^2.a]
Office	0.0560
Retail	0.0677
Multi-family dwellings	0.0361
Single-family dwellings	0.0375

5.3 Formulas

The following formulas are used to calculate the CO_2 emission of the buildings in the portfolio. All calculations have been done per building. Summed results per use function (and when necessary per energy label) are presented in the report.

[1] CO_2-emission = CO_2 coefficient PCAF * useful floor area
> CO_2 emission [tonnes CO_2/a]
> CO_2 coefficient PCAF, as given in Table 18 in the Annex [tonnes CO_2/m^2.a]
> useful floor area, as given in the ABN AMRO datasheets [m^2] or market estimates in case actual data is not (yet) available.

[2] Attribution factor = outstanding amount / property value at origination
> attribution factor, ratio between outstanding amount and property value at origination [-]
> outstanding amount, as found in the ABN AMRO data under 'current loan amount' [€]
> property value at origination, as can be calculated with the ABN AMRO data:
= 'loan amount at origination' / '% ABN AMRO financing' [€]

[3] Financed CO_2-emission = CO_2-emission * attribution factor
> Financed CO_2-emission, as the main result of the calculation [tonnes CO_2/a]

[20] https://open.overheid.nl/repository/ronl-410b3d61-10db-4fd8-9512-f64bf063e6e1/1/pdf/Eindrapportage%20inijking%20energielabels%20utiliteit.pdf