Climate Impact Evaluation of Portfolio

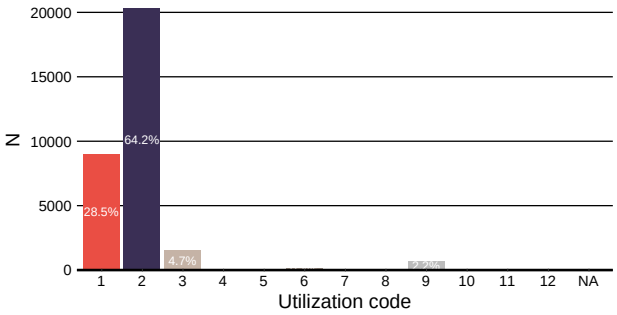
General information

Project number:	117244.0021
Client:	Banque cantonale de Fribourg
Version portfolio:	2025-12-31
Number of observations:	31’594
Total energy reference area in square meters:	11’295’203
Emission factors:	Emissionsfaktoren des Gebäudesektors
Processed by:	Margarita Agriantoni
Date:	2026-01-26

Portfolio

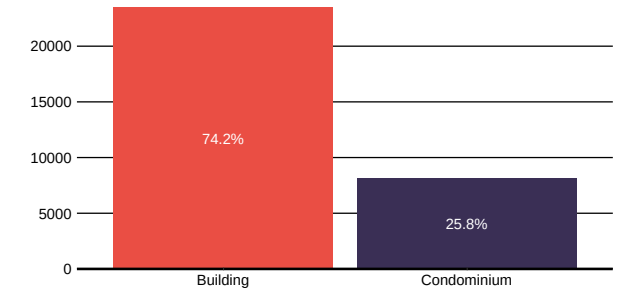
Descriptive analysis of key variables

Utilization

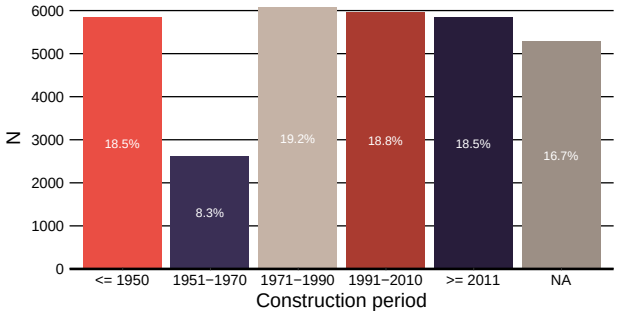


1 ... Residential, multi−family house
2 ... Residential, single−family house
3 ... Administration/Office
4 ... School
5 ... Retail
6 ... Restaurant
7 ... Assembly center
8 ... Hospital
9 ... Industry
10 ... Warehouse
11 ... Sports building
12 ... Indoor swimming pool

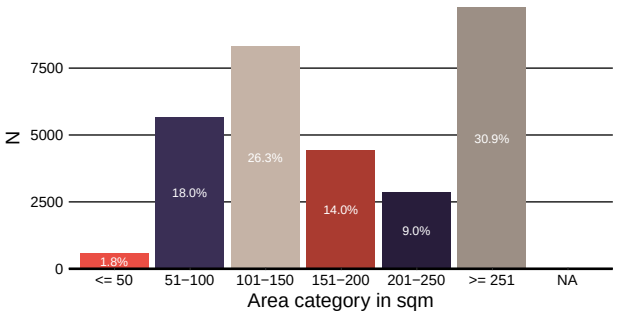
Buildings and condominiums



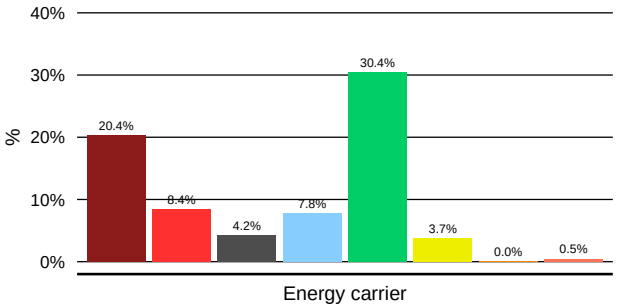
Construction period

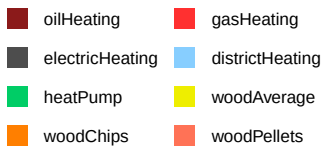


Area category



Energy carrier distribution portfolio





Data quality

Data origin

Variable	Original Data	GWR	Other	Missing Data
Area	40 %	45 %	15 %	0 %
Floors	12 %	46 %	26 %	16 %
Construction Year	48 %	35 %	0 %	17 %
Energy Carrier	0 %	57 %	19 %	24 %

Notes:
This table shows the origin of each of the key variables (if the variable was available in the client's dataset or had to be enriched with the GWR etc.). The category "other" includes the following specifications:

- The specification "weighted mean of portfolio" for the area.
- The specification "no number of floors necessary for condominiums" for the number of floors.
- The specification "monte carlo simulation" for the energy carrier.

Data quality score Wüest Partner

Data quality score WP	n	%
0: No calculation possible	8830	28 %
1: Data quality insufficient	2692	9 %
2: Data quality sufficient	20072	64 %
3: Data quality good	0	0 %
Total	31594	

Notes:

- "No calculation possible" means that important data was missing (from the original data and from the GWR). GHG emissions are only calculated for buildings that fulfill the following criteria:
  1. Coordinates are available with sufficient quality regarding spatial accuracy
  2. Year of construction, energy reference area, number of floors, utilization and heating source are available
  3. The sum of the area share of all utilizations is equal to 1
- "Data quality insufficient" can mean two things: Either the heating carrier is not known (neither from the original data nor from the GWR) and was enriched (i.e. Monte Carlo simulation, assumption oil heating). Or the area of a condominium was not available in the client's data and was enriched from the GWR by taking the average apartment size of all apartments in a specific building.
- "Data quality sufficient" states that at least one variable is enriched from the GWR or that the building is older than 30 years and no refurbishments are known.
- "Data quality good" indicates that none of the key variables had to be enriched from the GWR and that refurbishments are known for buildings that are older than 30 years.

Data quality score PCAF

PCAF data quality score	n	%
Score 1	0	0 %
Score 2	0	0 %
Score 3	0	0 %
Score 4	22764	72 %
Score 5	8830	28 %
Total	31594	

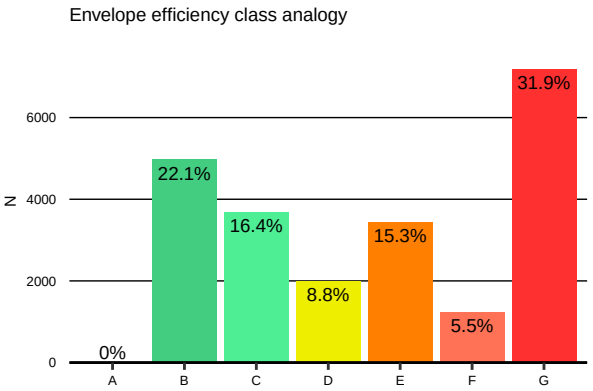
Notes:
PCAF stands for Partnership for Carbon Accounting Financials. Find more information here: https://carbonaccountingfinancials.com/standard.
The scores are described as follows:

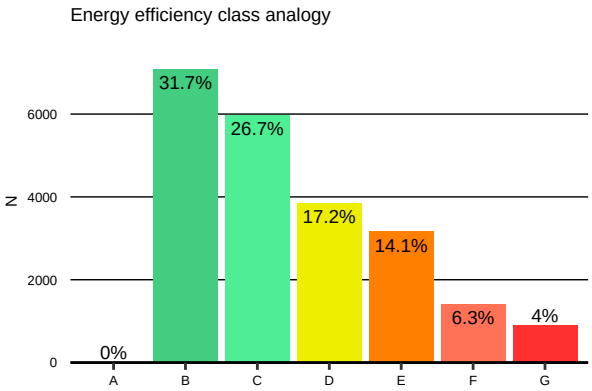
- **Score 1:** Primary data on actual building energy consumption (i.e., metered data) is available. Emissions are calculated using actual building energy consumption and supplier-specific emission factors specific to the respective energy source.
- **Score 2:** Primary data on actual building energy consumption (i.e., metered data) is available. Emissions are calculated using actual building energy consumption and average emission factors specific to the respective energy source.
- **Score 3:** Estimated building energy consumption per floor area based on official building energy labels AND the floor area are available. Emissions are calculated using estimated building energy consumption and average emission factors specific to the respective energy source.
- **Score 4:** Estimated building energy consumption per floor area based on building type and location-specific statistical data AND the floor area are available. Emissions are calculated using estimated building energy consumption and average emission factors specific to the respective energy source.
- **Score 5:** Estimated building energy consumption per building based on building type and location- specific statistical data AND the number of buildings are available. Emissions are calculated using estimated building energy consumption and average emission factors specific to the respective energy source.

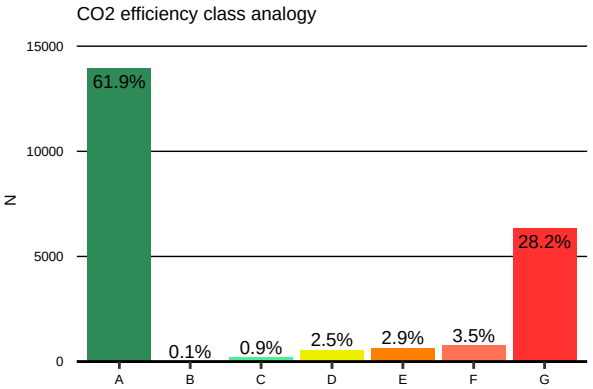
Simplified energy efficiency rating

Envelope, Energy and CO2 efficency

Class	Envelope Efficiency Class	Energy Efficiency Class	CO2 Efficiency Class
A	0 %	0 %	44 %
B	16 %	22 %	0 %
C	12 %	19 %	1 %
D	6 %	12 %	2 %
E	11 %	10 %	2 %
F	4 %	4 %	2 %
G	23 %	3 %	20 %
No calculation possible	29 %	29 %	29 %







Notes:

- **Envelope Efficiency:** The envelope efficiency describes the quality of the building envelope based on the simulated space heating energy demand. A well-insulated building reaches a better efficiency rating than a poorly or non-insulated building.
- **Overall Energy Efficiency:** The overall energy efficiency describes the performance of the weighted end energy demand. This includes heating energy demand, hot water demand, and further electricity demand and respective system efficiencies. A building can therefore perform well, when it uses little energy or when it is equipped with non-fossil heating systems or, ideally, both.
- **CO2 Efficiency:** The CO2 efficiency rating describes the amount of direct fossil emissions that are emitted on site. A building with a non-fossil heating system will, therefore, always be in class A.

Emission analysis

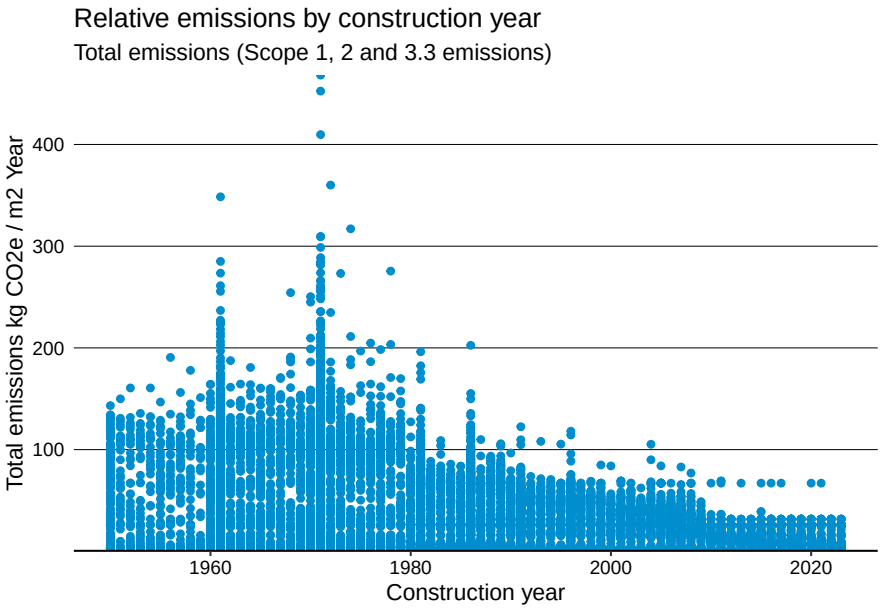
Greenhouse gas emissions

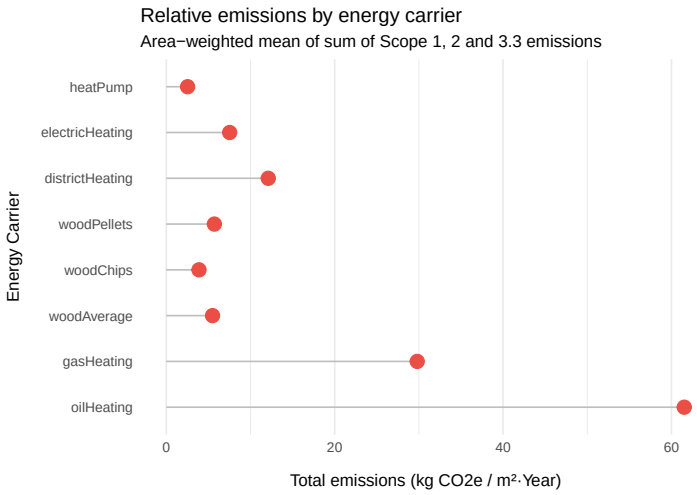
Measure	Scope 1	Scope 2	Scope 3.3	N
Relative emissions kgCO2e/ m2Year: Weighted Mean	15.9	1.8	6	31'594
Absolute emissions t CO2e/ Year	179'560.6	20'656.6	68'200.8	31'594
Absolute emissions x Coverage rate *	108'999.7	11'020.2	40'780.9	29'721

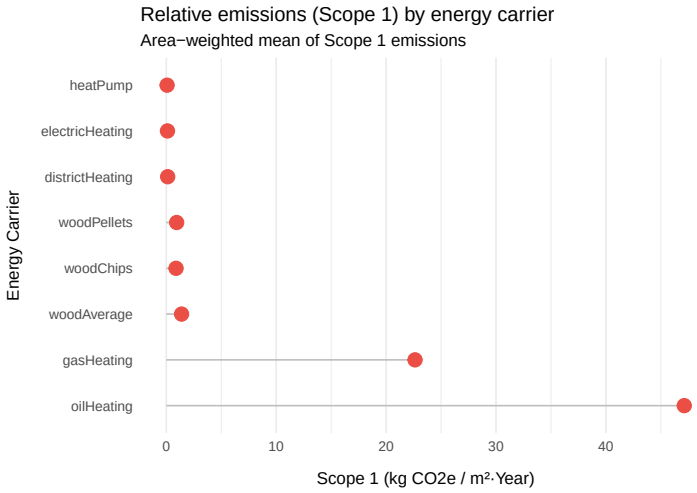
Notes:
* Absolute emissions covered by the bank/mortgage lender. This is calculated by multiplying the absolute emissions with the loan-to-value ratio.
Relative emissions denote the emissions per square meter (energy reference area). Absolute emissions denote the total per year emissions from the entire building (relative emissions multiplied by the energy reference area of the building).
The GHG Protocol defines how the GHG footprint of companies should be calculated.

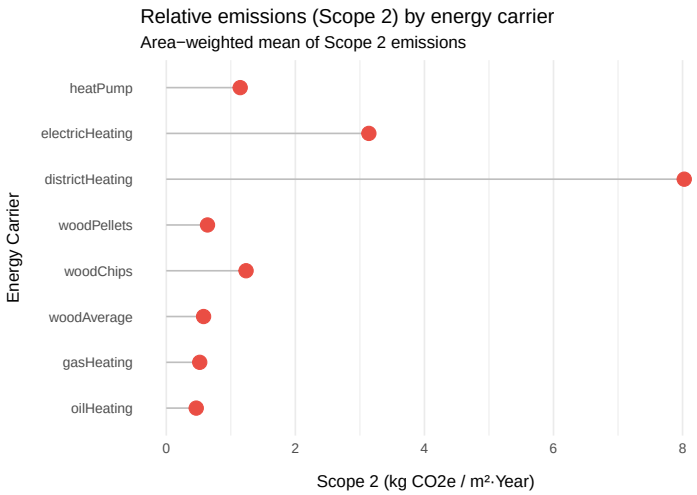
- Scope 1: Direct fossil emissions happening on premise.
- Scope 2: Indirect emissions occurring at the generation of imported energy such as electricity or heat (e.g., district heating).
- Scope 3.3: Emissions from upstream processes for extraction, production and transportation of the energy source or for the production facilities and their transportation of electricity (e.g. maintenance of the electricity grid).

Relative GHG emissions by construction year and energy carrier




Relative emissions by energy carrier
Area−weighted mean of sum of Scope 1, 2 and 3.3 emissions
Energy Carrier
heatPump
electricHeating
districtHeating
woodPellets
woodChips
woodAverage
gasHeating
oilHeating
0
20
40
60
Total emissions (kg CO2e / m²·Year)

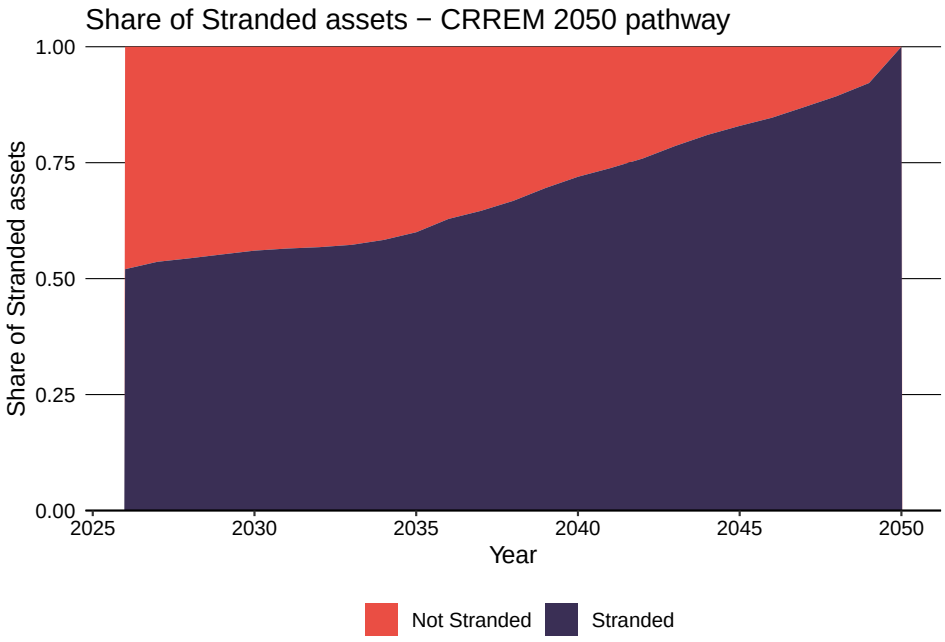

Relative emissions (Scope 1) by energy carrier
Area−weighted mean of Scope 1 emissions
Energy Carrier
heatPump
electricHeating
districtHeating
woodPellets
woodChips
woodAverage
gasHeating
oilHeating
0
10
20
30
40
Scope 1 (kg CO2e / m²·Year)

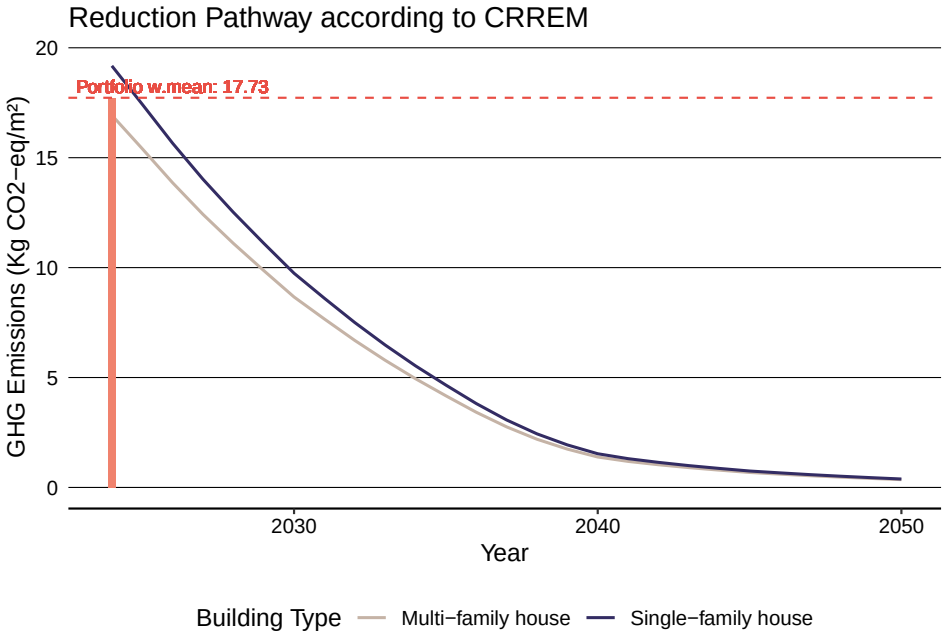

Relative emissions (Scope 2) by energy carrier
Area−weighted mean of Scope 2 emissions
Energy Carrier
heatPump
electricHeating
districtHeating
woodPellets
woodChips
woodAverage
gasHeating
oilHeating
0
2
4
6
8
Scope 2 (kg CO2e / m²·Year)

“

Transitory risks: Share of Stranded Assets

An asset is stranded, as soon as its emissions exceed the target emission of a chosen reduction path. We use the CRREM-SBTI reduction paths with horizon 2050 (see https://www.crrem.eu/tool/). The reduction paths are calculated top down using the global greenhouse gas budget. The greenhouse gas budget for achieving the 1.5° C targets of the Paris Climate Conference is decomposed by country and sector.

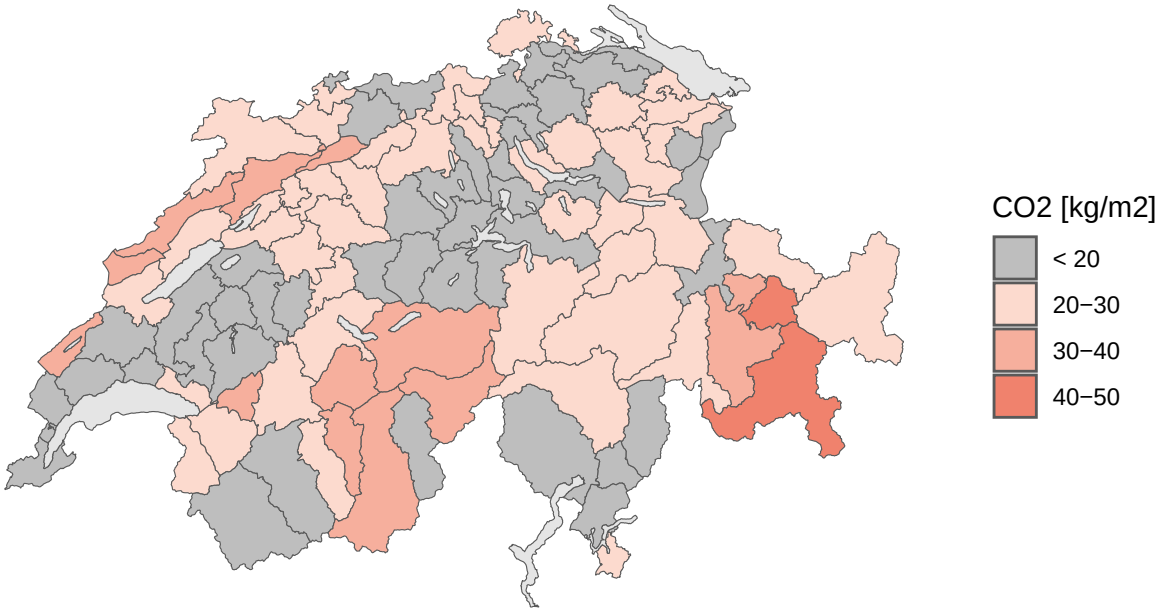




Notes:
The portfolio mean displayed in the plot corresponds to the weighted mean of scope 1 and 2 emissions.

Benchmark analysis

Weighted mean total emissions by MS region for heated building stock



Benchmark heated building stock by scope

	Scope 1	Scope 2	Scope 3.3	N
Portfolio Banque cantonale de Fribourg				
Relative emissions kgCO2e/ m2Year: Weighted Mean	15.9	1.8	6	31'594
Canton of Fribourg				
Relative emissions kgCO2e/ m2Year: Weighted Mean	17.3	1.9	6.6	77'060
Switzerland				
Relative emissions kgCO2e/ m2Year: Weighted Mean	21.1	1.6	7.4	1'867'917

Benchmark multi-family houses

	Scope 1	Scope 2	Scope 3.3	N
Portfolio Banque cantonale de Fribourg				
Relative emissions kgCO2e/ m2Year: Weighted Mean	13.7	2.4	5.3	868
Canton of Fribourg				
Relative emissions kgCO2e/ m2Year: Weighted Mean	14.7	2.5	5.7	12'297
Switzerland				
Relative emissions kgCO2e/ m2Year: Weighted Mean	19.9	1.7	6.7	422'378

Benchmark single-family houses

	Scope 1	Scope 2	Scope 3.3	N
Portfolio Banque cantonale de Fribourg				
Relative emissions kgCO2e/ m2Year: Weighted Mean	17.7	1.6	6.6	20'277
Canton of Fribourg				
Relative emissions kgCO2e/ m2Year: Weighted Mean	18.2	1.3	7	60'095
Switzerland				
Relative emissions kgCO2e/ m2Year: Weighted Mean	25.4	1.2	8.9	1'296'414

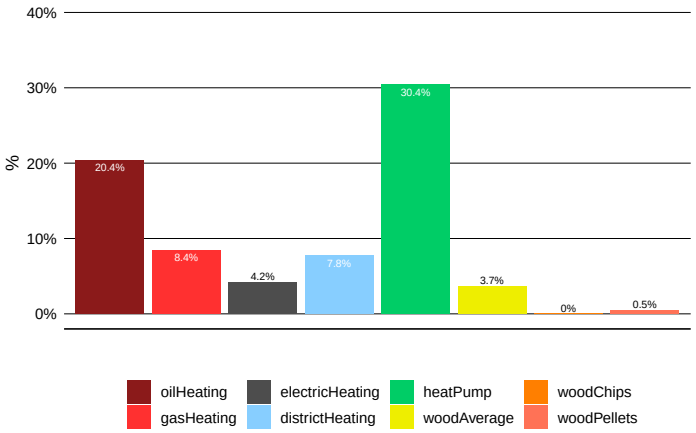
Distribution of emission intensity (sum of relative Scope 1, 2 and 3.3 emissions) in kgCO2e/a

Percentile	Portfolio Banque cantonale de Fribourg	Benchmark Fribourg	Benchmark CH
90	84.9	98.4	103.7
70	31.6	36.4	57.9
50	25.1	6.8	22.4
30	5	2.5	5.7
10	1.3	1.1	1.5

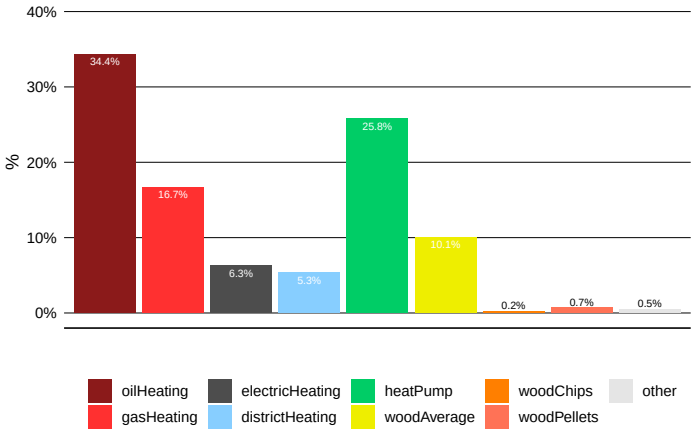
Notes: The percentiles of the benchmarks were calculated by using the heated building stock.

Heating carrier distribution in portfolio, heated building stock Switzerland and heated building stock Fribourg

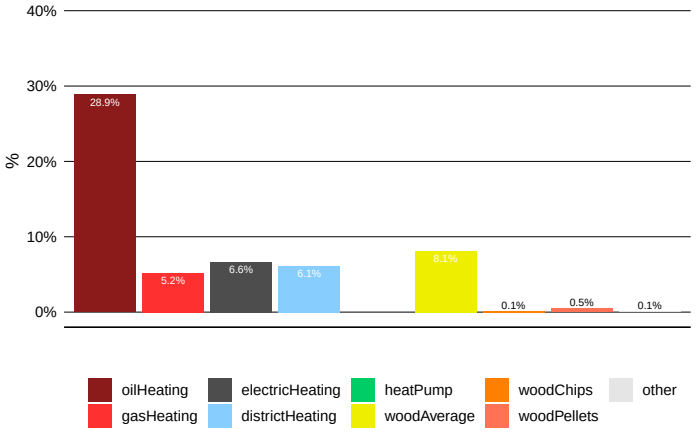
Energy carrier distribution portfolio



Energy carrier distribution heated building stock Switzerland



Energy carrier distribution heated building stock main canton



Assumptions

Assumptions utilization key

1. *Residential, multi-family house*
2. *Residential, single-family house*
3. *Administration/Office*
4. *School*
5. *Retail*
6. *Restaurant*
7. *Assembly center*
8. *Hospital*
9. *Industry*
10. *Warehouse*
11. *Sports building*
12. *Indoor swimming pool*

Assumptions condominiums

- *For the calculation of Scope 1 and 2 emissions, the position and the number of walls of condominiums must be specified.*
  - *The position of a condominium is defined by the following rules:*
    - *If "condominium floor" is equal to 0, the position is "ground floor".*
    - *If "condominium floor" is greater than 0 and less than the total number of floors (minus ground floor), the position is "middle".*
    - *If "condominium floor" is greater than 0 and equal to the total number of floors (minus ground floor), the position is "top floor".*
    - *For combinations or missing data, "ground floor" is assumed.*
  - *The number of walls is derived using the following rules:*
    - *If "house type" equals "Detached" or "Rustico" or is missing, the number of walls is 4 (Worst case assumption).*
    - *If "house type" is equal to "Attached end building", the number of walls is 3.*
    - *If "house type" is equal to "Attached midterrace building", the number of walls is 2.*
    - *If the area of the dwelling is less than or equal to 50*

Assumptions refurbishment years

- *Assumption of refurbishment year for windows, facade, roof and basement:*
  - *If a refurbishment year for windows, facade, roof or basement is available in the original data, then this is used.*
  - *If there is no refurbishment year in the original data for specific building components, the following rule is applied:*
    - *If a refurbishment took place more than 40 years (>=) and less than 60 years (<) after the year of construction and the refurbishment costs were greater than 30*
    - *If the refurbishment took place more than 60 years (>=) after the year of construction and the refurbishment costs were greater than 50*
    - *To derive the building costs, internal benchmarks are used based on year of construction and standard. These benchmarks are extrapolated into the past based on the construction cost index of the BFS. Benchmarks are only available up to 1998. If the year of construction is before 1998, the benchmark for 1998 is used. If no standard is available, a value of 3.0 is assumed.*
- *No general refurbishment years from the GWR are used.*

Assumptions carbon value at risk

1. *The cvar is calculated as follows:*

$$CVAR = \frac{NPV\left(\sum_{t=2022}^{2050}((emissions_t - emissions\,reduction\,path_t) \times emission\,price_t)\right)}{market\,value}$$

2. *Discount rate: Use of 30-year federal bond yield: 0.6*
3. *Carbon price: CO2 tax (BAFU) of CHF 120 /TCO2 in Switzerland*

Information regarding GRI Reporting Framework 305

1. *General information: The GRI Reporting assumes the perspective of the client. In this sense, the calculated emissions of the mortgage portfolio make part of Scope 3. Therefore, the following information refers to the GRI reporting chapter 305-3 (Scope 3).*
2. *Regarding point a: Information can be found in the report (chapter „Greenhouse gas emissions"). See absolute emissions.*
3. *Regarding point b: For the emission factors „Emissionsfaktoren des Gebäudesektors" (intep), the following greenhouse gases are included in the calculation: CO2, CH4, N2O, HCF's, SF6 and NF3 (see „Treibhausgas-Emissionsfaktoren für den Gebäudesektor", intep, p.7)*
4. *Regarding point c: The biogenic emissions are reported and can be found in the output file (variable „absolute-biogenic-oos", „oos" meaning „out of scope").*
5. *Regarding point d and e: Has to be defined by client.*
6. *Regarding point f: See title page for emission factors.*
7. *Regarding point g: We follow SIA Norms for the calculation procedure and the utilisation benchmarks. Standardised climate data from MeteoSchweiz is included. A more detailed description of the simulation procedure can be found in the model documentation.*