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# MuniFin Financed Emissions Report

Published in October 2024

**MuniFin**

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# Introduction

## About MuniFin

Municipality Finance Plc (“MuniFin”) is one of Finland’s largest credit institutions and the only one specialised in the financing and financial risk management of the municipal sector and state-subsidised social housing production.

MuniFin is 100 per cent owned by the Finnish public sector, Finnish municipalities, the State of Finland, and Keva, a public sector pension fund. Due to the shareholder base, MuniFin does not seek to maximise profit, but to serve efficiently and profitably as the best financing expert in the field, providing its customers with solutions that are the best fit for their needs.

The Act on the Municipal Guarantee Board defines the kinds of customers and projects that MuniFin can finance. MuniFin’s customer base includes Finnish municipalities, joint municipal authorities, municipally controlled entities and non-profit housing organisations nominated by the Housing Finance and Development Centre of Finland (ARA). The Finnish municipalities organise services for their residents. Most of these services are defined by law as being duties of local government. In addition to the statutory duties, the municipalities may assume other tasks of self-government themselves. These generally concern

the economy, employment, and housing. The wellbeing services counties, established in 2022 in connection with the social and healthcare reform in Finland, have also become MuniFin’s customers. MuniFin does not finance operations in competitive markets, and all its financed projects and customers are in Finland.

In MuniFin we believe that sustainable development is realised by meeting the social foundation – the social requirements that affect people’s wellbeing – while still staying within the Earth’s ecological limits. In practice, this requires the fulfilment of needs related to things like health, education and housing, while at the same time ensuring that climate change does not spin out of control, that we can adapt to the climatic changes that have already taken place and that biodiversity is safeguarded or restored. We are convinced that the financial markets can help to solve the challenges of the environment and society.

Projects that the group finance include schools, day care centres, hospitals, healthcare centres, libraries, community centres, roads, bridges, sewerage, rental apartments, and housing for people with special needs, inter alia. Through

general lending we also finance Municipalities operating expenses within their annual budget. Finland’s municipal sector, wellbeing services counties and affordable social housing organisations have a key role in both social and ecological sustainability in Finland. The decisions, actions and investments of our customers make a great difference to the achievement of Finland’s sustainability goals and the progress of the green transition.

Sustainability is one of MuniFin’s core values, and it is also reflected in the company’s strategy as well as sustainability policy<sup>1</sup>. As a vital part of the group strategy MuniFin has published its first Sustainability agenda<sup>2</sup> in autumn 2023 which aims to clarify MuniFin’s key role as one of the enablers of sustainable welfare in society. The agenda includes MuniFin’s first emission reduction target for Real Estate portfolio. The PCAF membership, methodology development and reporting has been an integral part of this work and continues in the future.

<sup>1</sup> <https://www.kuntarahoitus.fi/en/raports/munifin-sustainability-policy>

<sup>2</sup> <https://www.kuntarahoitus.fi/en/sustainability/sustainability-agenda>

## Towards a greener future with our customers

In the OECD's report titled "[Well-Being in Finland: Bringing together people, economy and planet](#)", Finland is regarded as "an established international leader in well-being and sustainability, with good outcomes for people, the economy and the planet in a wide range of well-being aspects". However, the report also mentions key future challenges that Finland must address in order to meet the conditions for maintaining a sustainable welfare society.

Climate change will affect Finland in various ways. Due to our country's geographical location, temperatures in Finland are expected to rise faster than the global average. Heat waves, increasing droughts, shorter winters and extreme weather events will affect all natural ecosystems. Rainfall is predicted to increase, and its distribution remains uncertain. Moreover, rising sea levels could pose new environmental risks for coastal regions. Given these looming changes, there is an amplified urgency across all sectors to adapt, intensify efforts to mitigate climate change and actively combat biodiversity loss.

In order to prepare for the challenges of climate change and to do its part in solving the climate crisis, Finland has written down one of the world's most ambitious climate goals in its [Climate Act, aiming for climate neutrality by 2035](#) and further

emission reductions after that. The Act also has a stated objective that national measures are taken to adapt to climate change by promoting climate change resilience. In addition to sustainability, Finland's climate policy aims to ensure the fairness of climate actions.

The decisions, investments and financial standing of our customers, such as municipalities and the entities under their control, are pivotal in determining Finland's ability to respond to the challenges and goals of the green transition. Municipalities have important roles in achieving both international and national environmental goals and especially in creating conditions for sustainable life locally. The municipal and affordable social housing production sectors impact Finland's sustainability through energy production, buildings, transportation, land use planning, forestry, waste management, circular economy solutions and water and wastewater management. As a public sector lender, MuniFin is committed to furthering these objectives and wants to act as a partner for all our customers in enabling and speeding up their climate work.

In October 2023 MuniFin published its updated sustainability strategy. The [Sustainability agenda](#) aims to clarify the group's role in achieving international and national targets and

summarises the main themes and goals of our sustainability work. Entitled "Enabler of sustainable welfare in society", our Sustainability agenda focuses on the impacts that we can create in our value chain through our business operations. The agenda is built on two main themes: foundation of the Finnish welfare society and driver of the green transition (see figure 1). As they are closely interlinked, both themes must be addressed for basic social needs to be met within the limits of the planet's carrying capacity. In line with these themes, our goal is to help build and develop the foundations for a sustainable welfare society and promote investments that benefit the climate and environment.

The second theme "driver of the green transition" and its goals are understandably closely interconnected to our PCAF membership and financed emissions disclosed in this report. Financed emissions refer to emissions associated with the customers and projects that we finance. In the case of financial institutions, focusing on lowering financed emissions is important because of their scale. By reducing our financed emissions, we can reach an impact that is many times greater than that of reducing our own emissions only. This means that our customers need to have ambitious climate targets and capabilities as well.

The first financed emissions goal that we have set in our Sustainability agenda is for buildings, because the financial sector already has an established methodology for this and the data quality has improved during the last few years. Moreover, our real estate portfolio accounts over 50% of our long-term customer finance portfolio. The average energy efficiency of buildings included in our portfolio must be improved, and the energy production for these buildings must rely increasingly on low-carbon energy sources. The carbon intensity of buildings must also continue to decrease even after the 2035 goal has been reached, which is why the goal must be revised in the future. Please see more information on the target and our progress from page 14 onwards.

As we are member of PCAF, we are committed to calculating and disclosing our financed emissions. PCAF aims to develop and implement a standardized approach to assessing and disclosing the greenhouse gas emissions associated with loans and investments.

Our sustainability work is by no means limited to merely setting these goals – it is an evolving journey that requires constant development, efficient use of data and frequent updating of the agenda. This is also the case with financed emissions calculation methods and further target setting. It is also essential that we integrate the identified sustainability perspectives such as financed emissions into our risk management practices.

**Enabler of sustainable welfare in society**

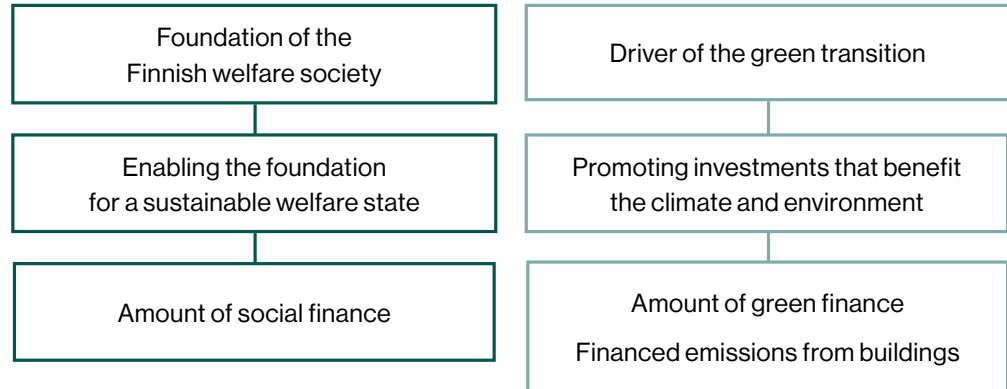


Figure 1: Enabler of sustainable welfare in society

# MuniFin's approach and PCAF methodology

MuniFin joined the Partnership for Carbon Accounting Financials (PCAF) in 2022. Membership of the initiative requires the company to report its financed emissions 3 years after joining. This industry led initiative aims to develop and implement a standardised method for greenhouse gas emissions (GHG) accounting for the financial industry to align financial portfolios with the Paris Agreement.

PCAF is a partnership of financial institutions with over 400 members worldwide that work together to implement a harmonised and transparent method for GHG accounting. By joining, MuniFin commits to measure and disclose GHG associated with its lending and liquidity portfolios.

PCAF has proven to be the most widely adapted standard in the financial sector for calculating financed emissions. By joining PCAF MuniFin wanted to be able to better understand its financed emissions which are the most significant emissions for financial industry. By doing the calculations and improving them yearly the group is in better position to make informed decisions in the future. MuniFin's history with financed emissions calculation goes back to the year 2021 when MuniFin carried out this calculation for the first time

for 2020 financed emissions. Since the beginning, MuniFin has applied the PCAF standard where applicable and improved calculations annually. So far MuniFin has conducted calculations for the year 2020, 2021 and 2022.

With this report MuniFin publishes its financed emissions for the first time and is committed to do this annually going forward. Please note that emission calculations usually lack behind financial reporting, due to updates in the underlying data such as emissions factors. Possible changes in the methodology will be presented in the report and recalculations are conducted if change in the results turn out to be material and/or have a significant effect to the targets the company has set. MuniFin is committed to develop and improve its calculations yearly so that it always aims to correspond to the best market practices available. For the asset classes, which PCAF does not provide a methodology to, MuniFin has used external help to come up with a methodology which in best effort basis describes the financed emissions. MuniFin is open for any suggestions to further develop its calculations which are essential in further target setting.

Currently MuniFin discloses its financed emissions in this separate report. The latest calculations are based on the financial year 2022. MuniFin has begun calculating emissions using 2023 data, and the new report will be released in the first half of 2025. This report will also include scope 3 emissions for asset classes which have a methodology available. Please note that MuniFin is subject to CSRD regulation, which may impact the format and schedule of future financed emissions reporting. MuniFin has used an external partner for PCAF expertise and calculations.

The calculations in this report are based on the data at the time of calculation. The calculations are done separately from the financial statement process with an external partner. For this reason it is possible that small reconciliation differences with the financial statement information occurs in figures denominated in euros. Please also note that financed emission calculations may also have exclusions due to asset class type and a selection of available methodology. MuniFin has investigated the possible differences and concluded that they are not material in terms of emission calculation results.

## Scopes

Estimations were made based on the Global Standard, developed by the Principles for Carbon Accounting Financials (PCAF), which provides detailed guidelines to calculate GHG emissions, depending on asset class and data availability.

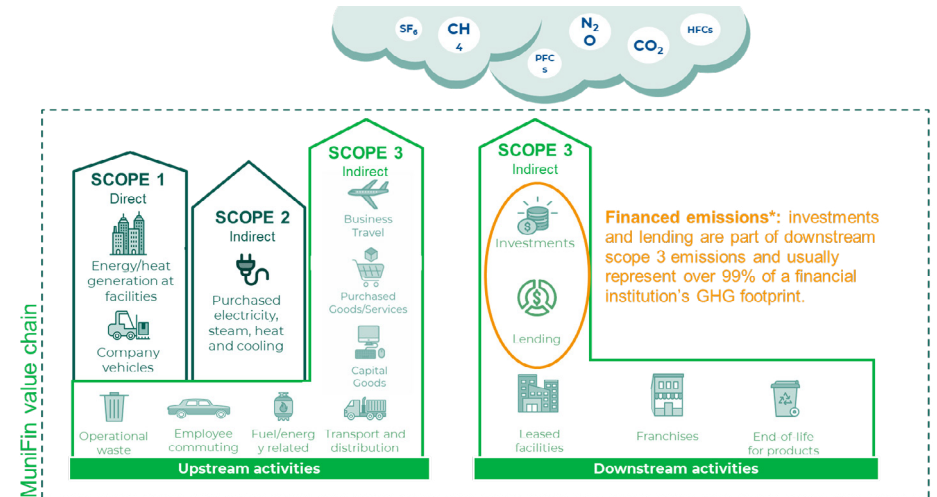
PCAF's Standard follows the GHG accounting methodology from The Greenhouse Gas Protocol (GHG Protocol), which divides emissions into direct and indirect emissions. Direct emissions are those originating from sources owned or controlled by the reporting entity. Indirect emissions are generated as a result of the reporting entity's activities but occur at sources owned or controlled by another entity. The direct and indirect emissions are divided into three scopes as shown below (Figure 2).

**Scope 1:** includes all carbon emissions that can be directly managed by the organisation (direct GHG emissions). This includes the emissions from the combustion of fossil fuels in mobile and stationary sources and carbon emissions generated by chemical and physical processes, as well as fugitive emissions from the use of cooling and air-conditioning (AC) equipment.

**Scope 2:** includes indirect GHG emissions from the generation of purchased electricity, steam, heat or cooling purchased by the organisation from external energy providers.

**Scope 3:** includes other indirect emissions, such as emissions from the extraction and production of purchased materials and services, vehicles not owned or controlled by the reporting entity, outsourced activities, or investments/lending (category 15). Category 15 in scope 3 is referred as "financed emissions" and it's the most relevant category for financial institutions, since it usually represents 99% of its footprint.

The footprint analysis of financed emissions for a financial entity entails calculating the Scope 3 emissions of the investor or financier, which are the Scope 1 and 2 emissions of borrowers or investees, as outlined by the GHG Protocol Category 15: investments and the Global Standard. As methodologies develop it might be possible to add scope 3 emissions of borrowers or investees for some asset classes in the future. These emissions would be presented separately from scope 1 and 2 emissions.



\*Financed emissions figures should be seen as indicative rather than exact. Due to the data limitations, emissions are "estimated" financed emissions as most results have a degree of error.

Figure 2: Scopes

## Methodology

The PCAF Standard provides a carbon inventory for financial institutions based on the various levels of data availability and quality. It delivers absolute and intensity metrics, which enables MuniFin to understand the carbon exposure of its portfolio and provide a platform from which future climate action can take place.

Under the 'GHG Protocol Category 15 'Investments'', carbon accounting of investment activities focuses on measuring or estimating the Scope 1 and Scope 2 emissions of borrowers and investees. In relation, the protocol outlines two overarching methods to conduct a portfolio footprint and assess the total financed emissions: the investment-specific method and averaged-data method. The selected method is based on the data availability per investment or loan.

### Investment-specific method

The investment-specific method collects and uses reported and/or audited Scope 1 and Scope 2 emissions data from the investee or borrower based on publicly available disclosure. The emissions of each investee or borrower are then attributed to MuniFin based on the ownership principle and represent MuniFin's financed emissions.

### Averaged data method

For investments where the company-level Scope 1 and Scope 2 emissions data or physical activity data needed to carry out a GHG accounting are not attainable, investee's emissions were estimated using averaged data, including calibrated industry proxies or environmentally extended input-output (EEIO) data. The Global Standard provides guidelines detailing various options to carry out estimations, including the type and source of averaged data needed based on the granularity and quality of the investee or borrower data available.

It is worth noting that due to the nature of estimates based on averaged data, the lower the quality and granularity of the data used to estimate emissions, the more indicative the resulting emissions figures become. As part of the results, the data quality scores for calculations are communicated.

### Attribution

In line with the GHG Protocol's 'ownership principle', investee emissions are allocated to the investors who 'own' them and are therefore in the position to change them. GHG emissions from equity investments are proportionally allocated 'per

share' to the investor. If an investor owns 0.1% of a company, 0.1% of the company's greenhouse gas emissions are allocated to them. In cases where financial data for the investee or borrower is limited (e.g., no revenue, valuation or equity plus debt data is available), the attribution guidelines from the Global Standard are used. This provides an array of options to obtain an attribution factor based on data points available, with the aim of attributing investee or borrower emissions as accurately as possible.



## Data quality

The Global Standard provides data quality scores to illustrate both the calculation approaches possible and the accuracy of the estimations given the data that is available. Score 1 represents audited emissions data from the investee and therefore a high degree of accuracy. Score 5 represents economic activity-based estimations using limited data, with a lower degree of accuracy and representing indicative results. The data available and data scores for equity investments can be seen in Figure 3. Regarding MuniFin emission calculations the average data quality scores for each asset class can be found in the respective result pages.

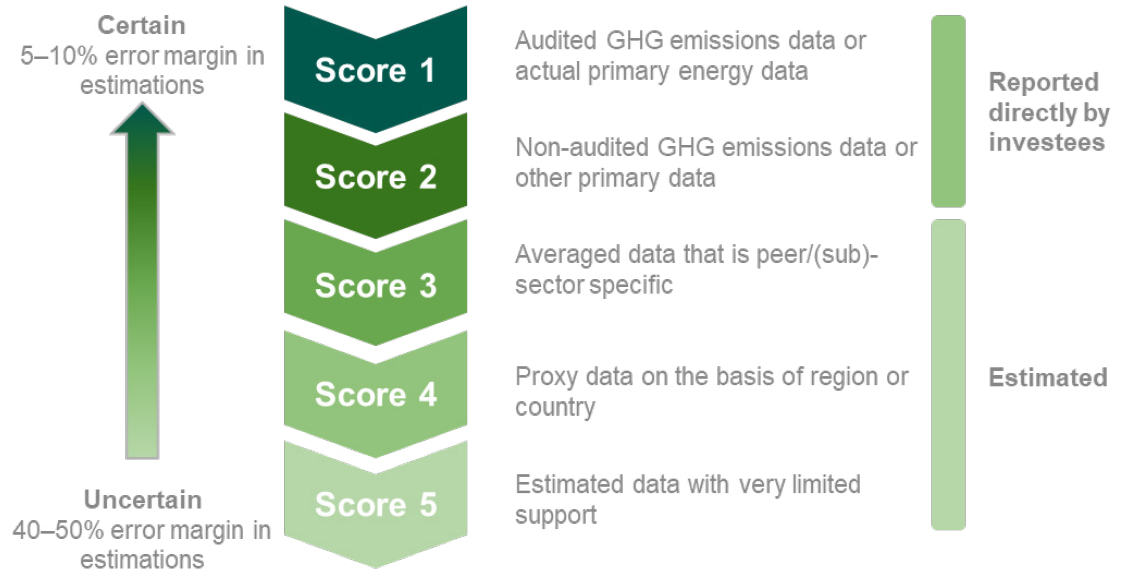


Figure 3: Data quality

## Interpretation and changes to the financed emissions

Financed emissions are estimates whose accuracy depends on the underlying data and methodological choices one has had to make during the calculation. While the uncertainty is greater for averaged-data methods this also relates to the investment-specific method where the original reporter has had to make similar decisions with the data and methodology. The uncertainty doesn't however mean that the results would be unusable.

Financed emissions calculations are not static but develop over time. As the availability and quality of the data improves, so do the calculations. Similarly methodological market practices develop as players gain experience and are able to overcome challenges they faced before.

When utilizing financed emissions as a metric, it's imperative to consider a range of factors that can impact its accuracy and relevance. These factors encompass changes in financed companies' or collateral assets' real-world emissions, shifts in exposure or the value of these entities – including changes tied to attribution factors, and modifications in the data

sources or methodologies used for estimation (as discussed above). When conducting a comparative analysis of financed emissions between two distinct reporting periods, it's essential to bear in mind all three change-inducing factors. This is particularly crucial in sectors where a small subset of clients is responsible for a significant proportion of emissions, thereby leading to substantial fluctuations in on-balance exposure.

It's important to note that financed emissions tied to regional and consumption-based data are not directly comparable to organizational or physical activity based-emissions. The dynamics and context of regional emissions might differ significantly from those of individual organizations. In addition, PCAF does not yet have a direct methodology for municipality loans which is why PCAF methodology for sovereigns was used and adapted (see p. 17) for this purpose. As MuniFin has a specific business model and a significant part of its customers are municipalities, we see that it is still important to disclose these emissions and further develop this method.

In addition, there is the time lag of the data to take into account. For example, municipalities' emissions were calculated using GDP data from 2021 because the 2022 data was not available at the time. Time lags can also consider emissions factors which is why the latest available factors are used. We acknowledge the importance of using up-to-date data and hope to continuously restate figures with more recent data in the future to enhance the accuracy and relevance of our analysis in this regard.

## Covered asset classes

Table shows the division of asset classes for MuniFin's portfolio, based on PCAF's categories and methodologies. "Derivatives contracts" and "other items" were excluded from the calculation, as there is no methodology to calculate the emissions for these asset classes yet. MuniFin's financed emissions include only on-balance sheet exposures.

Asset class	Definition
<b>Business loans</b>	Loans to municipal controlled entities and joint municipal authorities. These were classified as business loans instead of municipal loans since the loan is made to an entity and not the actual municipality. PCAF methodology was followed.
<b>Real estate related loans</b>	Loans made for the specific purpose of purchasing/refinance real estate. PCAF methodology was followed.
<b>Motor vehicle loans</b>	Loans made to entities or consumers to finance motor vehicles. PCAF methodology was used.
<b>Municipal loans</b>	Loans issued from a municipality or municipal federation to raise capital for spending needs. PCAF methodology was followed and adapted to ensure a more accurate approach.
<b>Listed bonds</b>	Fixed income assets issued by Financial Institutions, Sovereigns, as well as Sovereign Agencies and Supranationals. PCAF methodology was followed.
<b>Sovereign bonds</b>	National government-issued debt security to raise capital for spending needs. PCAF methodology was followed.

## Reporting principles & PCAF requirements

For PCAF reporting, financial institutions are required to utilize either the operational control approach or the financial control approach, encompassing all financed emissions in their scope 3 category 15 reporting. PCAF has established key reporting principles, including relevance, completeness, consistency, transparency, and accuracy.

The purpose of financial institutions' reporting should align with their specific business objectives, such as identifying and managing climate-related transition risks or achieving emissions reduction targets. Reporting must occur at least annually and align with the financial accounting cycle, offering a representative view of emissions for that reporting year. Any significant changes near the reporting date should be transparently disclosed.

In accordance with the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, financial institutions must establish a baseline recalculation policy,

defining when recalculation of base year financed emissions is necessary to maintain data consistency, comparability, and relevance over time. A significance threshold triggering base year emissions recalculations should be established and disclosed.

A significance threshold is a qualitative and/or quantitative criterion used to define any significant change to the data, inventory boundaries, methods, or any other relevant factors. MuniFin follows this principle and recalculations are conducted if a change in the methodology and thus results turn out to be material in regards of existing emission reduction targets. MuniFin uses SBTi (Science based Target Initiative) 5 % suggestion. The threshold triggers the need for a separate evaluation of the recalculation need. In all cases MuniFin will disclose any significant changes in the results or methodology as well as a plan to execute the possible recalculations if needed.

Financial institutions should publicly disclose their financed emissions in reports such as (semi)annual reports, website articles, or other appropriate sources. Additionally, they may disclose financed emissions for multiple comparable time periods when relevant for their business goals, allowing for a historical performance evaluation. MuniFin has begun calculating emissions using 2023 data, and the new report will be released in the first half of 2025. This report will also include scope 3 emissions for asset classes which have a methodology available. Please note that MuniFin is subject to CSRD regulation, which may impact the format and schedule of future financed emissions reporting.

# Summary of the results 2022

## Summary of results per asset class

Asset Class	Outstanding amount (mEUR) 31.12.2022	Weight Across Funds (%)	Analyzed Amount (mEUR)	Coverage (%)	Share of Total Financed Emissions (%)	Financed Emissions (tCO <sub>2</sub> e / year)	Carbon Intensity (tCO <sub>2</sub> e / mEUR Invested)	Weighted Average Data Quality Score
<b>Customer finance portfolio</b>								
Municipal loan <sup>2</sup>	11 791	36,7 %	11 765	99,8 %	86,8 %	1 724 244	147	2,0
Real estate	17 928	55,8 %	17 928	100,0 %	7,4 %	147 811	8	3,3
Business loans	2 362	7,4 %	2 362	100,0 %	5,7 %	112 645	48	4,0
Motor vehicle loans	49	0,2 %	49	100,0 %	0,0 %	835	17	5,0
<b>Investment portfolio</b>								
Listed bonds	3 178	96,2 %	2 987	94,0 %	89,8 %	202 765	68	2,6
Sovereign bonds	124	3,8 %	124	100,0 %	10,2 %	23 153	187	2,0

<sup>2</sup> Adapted PCAF sovereign debt method was used. Please note these are not directly comparable to entity level emissions since emissions are territorial emissions. Please see section *Municipal loans* for more information on page 17.

# Customer finance portfolio

## Real estate<sup>3</sup>

### Scope

This asset class contains loans made for the specific purpose of constructing/purchasing/refinancing real estate assets. MuniFin's portfolio comprises residential and municipal housing units, including but not limited to social housing, schools, hospitals, or kindergartens.

### Size of the portfolio

Real estate related loans consisted of an outstanding amount of 17,928 mEUR, which represent 55.82% of the Customer Finance Portfolio. The emissions coverage for Real estate loans was 100%.

### Methodology

PCAFs methodology for Mortgages was used for this asset class, which consists of the formula on the right.

$$\text{Financed emissions} = \sum_b \text{Attribution factor}_b \times \text{Building emissions}_b$$

(with b = building)

$$\text{Attribution factor}_b = \frac{\text{Outstanding amount}_b}{\text{Property value at origination}_b}$$

(with b = building)

$$\text{Building emissions} = \text{Estimated energy consumption from energy label} \times \text{Floor area} \times \text{Average emission factor}$$

When data was limited, estimations were made using Finland's average energy consumption and average property price per square metre, based on the outstanding amount:

$$\text{Financed emissions} = \text{Outstanding amount} \times \text{Avg.property value/sqm} \times \text{Avg.energy consumption} \times \text{Emission factor}$$

<sup>3</sup> MuniFin has set its first emission reduction target for its real estate portfolio, please see here <https://www.kuntarahoitus.fi/en/sustainability/sustainability-agenda>

Real estate	Description	Data source	Data quality score
Emissions	Emissions were obtained from the building's energy consumption (based on energy performance certificates) and average electricity/heating emission factors.	Reported energy efficiency (kwh/m <sup>2</sup> ): MuniFin  Emission factor: CRREM Global Pathways (2022) obtained from the <a href="#">PCAF database</a> (needs registration)	3
	Estimations were made using Finland's average energy consumption and average property price per square metre, based on the outstanding amount.	Average Finland residential energy efficiency (GJ/m <sup>2</sup> ): <a href="#">IEA</a>  Average property value per m <sup>2</sup> 2021 (EUR/m <sup>2</sup> ): <a href="#">Statistics Finland</a>  Emission factor: CRREM Global Pathways (2022) retrieved from the <a href="#">PCAF database</a>	4
Attribution	Outstanding amount: refers to the outstanding amount from each loan.	MuniFin	3/4
	Property value at origination: market value of property	MuniFin	3
	Average property value per square meter	<a href="#">Statistics Finland</a> (2021)	4

### Results and comparison with previous years

	2020	2021	2022
<b>Outstanding Amount (mEUR)</b>	13,140	16,590	17,928
<b>Weight Across Funds (%)</b>	45.6	55.0	55.8
<b>Analysed Amount (mEUR)</b>	13,140	16,590	17,928
<b>Coverage (%)</b>	100	100	100
<b>Financed Emissions (tCO<sub>2</sub>e / year)</b>	154,284	167,633	147,811
<b>Economic emission intensity (tCO<sub>2</sub>e / mEUR invested)</b>	12.4	10.1	8.2
<b>Physical emission intensity (tCO<sub>2</sub>e / m<sup>2</sup>)<sup>4</sup></b>	0.0180	0.0120	0.0117
<b>Data Quality Score</b>	3.95	3.51	3.28
<b>Share of reported data: Market value of property (%)</b>	1.8	58.3	57.8
<b>Share of reported data: Property area (%)</b>	1.8	56.7	59.6
<b>Share of reported data: Energy consumption (%)</b>	1.8	32.5	59.6

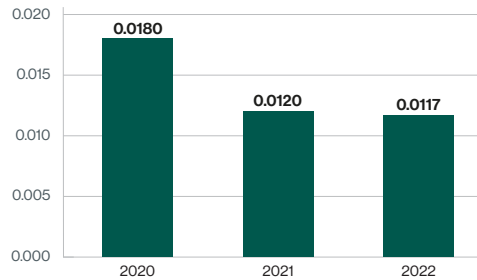


Figure 3: Physical emission intensity (tCO<sub>2</sub>e / m<sup>2</sup>)

<sup>4</sup> MuniFin's target for physical emission intensity is 0,08 tCO<sub>2</sub>e/m<sup>2</sup> by 2035. Please see our Sustainability agenda.

### Limitations

- Some loans didn't report data such as property value, area and energy consumption therefore these values were estimated separately. The average energy efficiency of residential buildings in Finland (kWh/m<sup>2</sup>) was estimated by multiplying the average Finland residential energy efficiency (GJ/m<sup>2</sup>, IEA) by a conversion factor from GJ to kWh (UK BEIS).
- To elucidate the reduction in emissions financed between 2021 and 2022, it was determined that the group was able to include more comprehensive energy consumption data in 2022 compared to 2021. This signifies that the calculation process in 2022 was more precise, corroborated by a decline in the average data quality score.

### Assumptions

- Average property of value per square meter was calculated based on real estate prices from Statistics Finland.
- Average Finland residential energy efficiency from IEA was considered as average energy consumption.
- The CRREM Global Pathways (2022) emission factor was retrieved from the PCAF database. It represents the total average across residential buildings in Finland (in tCO<sub>2</sub>e/MWh). In 2022, the value is 0.1101 tCO<sub>2</sub>e/MWh.
- This choice is justified as it aligns to the portfolio's mix of residential and municipal housing, and ensures accuracy by considering Finland's unique building practices, energy sources, and climate conditions. Additionally, the PCAF database is a reputable source known for data quality and reliability, further supporting the selection.
- The calculations for 2020 and 2021 were restated using the same emission factor to ensure consistency and comparability.



## Municipal loans

### Scope (what was included)

This asset class includes loans issued from a municipality or municipal federation to raise capital for spending needs.

### Size of the portfolio

Municipal loans consisted of an outstanding amount of EUR 11, 791 million, which represent 37% of the Customer Finance Portfolio. The emissions coverage for Municipal Loans was 99.9%. The remaining 0.1% was not included in the analysis as these loans came effective in 2023, which is after the reporting period.

### Methodology

PCAF launched in December 2022 the 2nd version of the Global GHG Accounting and Reporting Standard for the Financial Industry. The 2nd version of the Standard includes an update on measuring and reporting financed emissions, a method for sovereign debt, and guidance to account for emission removals. The new method for sovereign debt does not include sub-sovereign or municipal debt, however this was the methodology that was considered as a base for this asset class.

Municipal loans results were estimated using the territorial approach. This approach is based on PCAF's sovereign debt methodology, adapted to municipalities. The formula on the right is proposed by PCAF to estimate financed emissions for sovereign debt (adapted to municipalities).

$$Financed\ emissions = \sum_m Attribution\ factor_m \times Municipality\ emissions_m$$

(with  $m = municipality\ borrower$ )

$$Attribution\ factor = \sum_m \frac{Outstanding\ amount_m}{PPP-adjusted\ GDP_m}$$

(with  $m = municipality\ borrower$ )

#### Methodology in practise:

First we have estimated municipal level GDP from an actual province level GDP based on the population of each municipality. This figure is then compared to the national level GDP and the municipality share of total national GDP generation is formed.

Secondly we convert the Municipal level GDP as PPP-adjusted GDP figure by multiplying it with the PPP-adjusted national GDP.

Thirdly emission factor for municipal level emissions is formed by dividing it with the PPP-adjusted GDP.

The formed emission factor aims to represent a municipal level emissions intensity (emissions per GDP generated).

Finally we attribute calculated emissions as financed emissions for MuniFin by multiplying the total outstanding amount with the emission intensity to get the MuniFin's share of the emissions generated by the municipality. The rationale behind this is that MuniFin lending towards Municipality is used to generate both GDP and thus territorial emissions inside the municipality.

As PCAF methodology does not include sub -sovereign or municipal debt this methodology was used. There might also be other possibilities to calculate municipal level financed emissions and MuniFin is happy to hear any suggestions and feedback regarding the methodology used.

Municipal loans – territorial approach	Description	Data source	Data quality score
Municipal emissions	<p>Emissions scope: sovereign emissions include country's production emissions.</p> <p>Instead of using country emissions, municipalities emissions were used from Syke's database. The Finnish Environment Institute (Syke) calculates the annual greenhouse gas emissions of Finnish municipalities by using the ALas model, which is usage-based and similar to the GHG Protocol's GPC standard, which is used for cities. This model includes what corresponds to scope 1 and 2 of a municipality, excluding industrial processes emissions.</p>	<p>Territorial approach: Municipality's emissions data from The Finnish Environment Institute (Syke), using methodology "All emissions" (2021 data).</p> <p>Syke usage-based emission database</p> <p><a href="https://paastot.hiilineutraalisuomi.fi/#en">https://paastot.hiilineutraalisuomi.fi/#en</a></p> <p><a href="https://www.hiilineutraalisuomi.fi/fi-FI/Paastot_ja_indikaattorit/Kuntien_ja_alueiden_kulutusperusteiset_kasvihuonekaasupaastot">https://www.hiilineutraalisuomi.fi/fi-FI/Paastot_ja_indikaattorit/Kuntien_ja_alueiden_kulutusperusteiset_kasvihuonekaasupaastot</a></p>	2
Attribution	<p>Outstanding amount: refers to the outstanding amount from each loan.</p>	<p>MuniFin</p>	
	<p>PPP-adjusted GDP: to adapt this to municipalities, the PPP-adjusted GDP from Finland was proportional to each municipality, based on each municipality's population (2021 data).</p>	<p>Finland's GDP PPP-adjusted: <a href="#">World Bank</a> (2021)</p> <p>Municipality's population: MuniFin (2021)</p>	

### Results and comparison with previous years

	2020 <sup>5</sup>	2021 <sup>6</sup>	2022
<b>Outstanding Amount (mEUR)</b>	14,136	11,137	11,791
<b>Weight Across Funds (%)</b>	49.1	37.3	36.7
<b>Analysed Amount (mEUR)</b>	14,137	11,219	11,765
<b>Coverage (%)</b>	100	99.9	99.8
<b>Financed Emissions (tCO<sub>2</sub>e / year)</b>	1,939,718	1,606,781	1,724,244
<b>Economic emission intensity (tCO<sub>2</sub>e / mEUR invested)</b>	137	143	147
<b>Data Quality Score</b>	2	2	2

### Limitations

- As mentioned before, PCAF does not have a methodology for municipal debt, therefore sovereign debt methodology was used as a base and adapted by using the “follow the money” principle.
- As Municipal level GDP data is not available, PPP-adjusted GDP from Finland was pro-rated to each municipality, based on each municipality’s population to give an estimate of the municipal level GDP. This was a change in methodology from 2020, where financial data per region was used as a GDP approximation approach for each municipality.

### Assumptions

- Loans that were originated prior to the 2022 period and matured during the year, and loans that were originated and matured during the year (short-term loans), were not considered in this exercise based on the following statement from PCAF’s Standard: *“Each asset class method currently only covers financial products that are on the balance sheet of the financial institution at the fiscal year-end. This means that financed emissions from products such as revolving credit facilities, bridge loans, and letters of credit are only considered if there is outstanding finance on the financial institution’s balance sheet at financial year-end. In a similar fashion, assets held for short durations and designated as held for sale are, for now, not included in the Standard.”*
- As Municipal level GDP data is not available, PPP-adjusted GDP from Finland was pro-rated to each municipality, based on each municipality’s population to give an estimate of the municipal level GDP.

### Key takeaways

- As it can be observed from the tables, the financed emissions from municipal loans decreased from 2020 to 2021, while the economic emission intensity increased. The slight decrease in absolute emissions follows the same outstanding amount trend, which also decreased from one year to another. However, the emissions from municipalities increased. For example, emission from Raahe increased from 1,523,700 tCO<sub>2</sub>e to 1,587,800 tCO<sub>2</sub>e in 2021, which explains the increase in economic emission intensity in the analysis.
- The increase in financed emissions between 2021 and 2022 is attributed to both the higher outstanding amount and the issuance of new loans during the year. For instance, in 2021 MuniFin issued 10 loans to Raahe, while in 2022 it issued 12.

<sup>5</sup> 2020 emissions were recalculated using a territorial approach.

<sup>6</sup> 2021 emissions were recalculated using a territorial approach.

- MuniFin acknowledges that there are also other possibilities to calculate financed emissions for Municipal loans as there currently isn't a methodology for this in the PCAF standard. If more accurate methodology comes available MuniFin will recalculate these emissions.
- PCAF (p. 121) acknowledges that double counting occurs in two dimensions. Firstly, emissions from non-sovereign sectors, such as corporations, can be double-counted due to territorial-level accounting. While this poses a challenge for financial institutions with diverse investment portfolios, it may not be problematic if emissions from different asset classes are clearly reported separately. This comprehensive accounting ensures informed lending or investment decisions. Secondly, emissions from other sovereigns can also be double-counted when accounting for emissions beyond scope 1. It's important to note that carbon emissions associated with sovereign debt reflect the production emissions of the

respective countries and are categorized under Scope 1. Consequently, there may be some overlap in emissions accounting. For example, emissions from energy production within the country contribute to production emissions. As such, the same limitations of the sovereign debt methodology apply to sub-sovereign bonds and loans. In addition, sub-sovereign emissions are initially encompassed within the sovereign emissions of the corresponding country. In cases where a portfolio comprises both sovereign and sub-sovereign assets, combining them in the same carbon footprint calculation may result in certain emissions being duplicated. Nevertheless, despite the possibility of double counting, the emission figures provide a comprehensive perspective and insight into the actual emissions associated with these loans.

## Business loans

### Scope

This asset class contains loans to municipal controlled entities and joint municipal authorities (referred to as “company” in the formulas below).

### Size of the portfolio

Business loans consisted of an outstanding amount of EUR 2,362 million, which represent 7.4% of the Customer Finance Portfolio. The emissions coverage for Business Loans was 100%.

### Methodology

The PCAF methodology for Business loans and unlisted equity indicates that emissions should be estimated using the formula on the right.

$$\text{Financed emissions} = \sum_c \text{Attribution factor}_c \times \text{Company emissions}_c$$

(with c = borrower or investee company)

Emissions data from municipal entities (or “company emissions”) were not available therefore emission factors and asset turnover ratios were used to estimate the financed emissions. The formula applied to these estimations depended on the availability of financial data, as follows:

For a data quality score of 4:

$$\frac{\text{Outstanding amount}_c}{\text{Total equity} + \text{debt}_c} \times \text{Revenue}_c \times \frac{\text{GHG emissions}_s}{\text{Revenue}_s}$$

(with c = borrower or investee company and s = sector)

For a data quality score of 5:

$$\sum_c \text{Outstanding amount} \times \text{Asset turnover ratio}_s \times \frac{\text{GHG emissions}_s}{\text{Revenue}_s}$$

(with c = borrower or investee company and s = sector)

Business loans	Description	Data source	Data quality score
Emissions	Entity emissions were estimated using sectoral emission factors provided in tCO <sub>2</sub> e per EUR of revenue per scope.	Emission factors database stemming from OECD environmentally extended input–output dataset.	4/5
Attribution	Outstanding amount: refers to the outstanding amount from each loan.	MuniFin	4/5
	Total equity + debt. For municipal entities the value for total assets was used.	MuniFin	4
	Asset turnover ratio: financial metric to estimate the potential revenue generated with the outstanding amount. This ratio is based on sector/ industrial activity (sectoral approach).	Asset turnover ratio database stemming from OECD environmentally extended input–output dataset	5

**Results and comparison with previous years**

	2020	2021	2022
Outstanding Amount (mEUR)	186	2,284	2,362
Weight Across Funds (%)	0.6	7.6	5.7
Analysed Amount (mEUR)	186	2,284	2,362
Coverage (%)	100	100	100
Financed Emissions (tCO <sub>2</sub> e / year)	1,921	137,322	112,639
Economic emission intensity (tCO <sub>2</sub> e / mEUR)	10	60	48
Data Quality Score	5	4	4

In 2022, data quality score for business loans was mostly 4, since most revenue and total asset data was provided, whenever financial data was not provided asset turnover ratios were used obtaining a data quality score of 5.

**Limitations**

- Financed emissions were calculated using averaged data which included data derived from the GHG footprint of companies from a similar region and sector to the investee companies of MuniFin.
- The specific end use was unknown for each loan, therefore the estimations were made based on the industries provided for each loan.

**Assumptions**

- Calculations were based on the principles of the 'GHG Protocol', which stipulates that the emissions should only be assigned to the corresponding months in which the loan was active. Therefore, all loans that started after 12/31/2021 were not considered.
- Nomenclature of Economic Activities (NACE) codes were used to map industries with NACE - Global Industry Classification Standard (GICS) mapping exercise.
- Emissions for scope 1 and scope 2 were estimated separately for reporting purposes.

## Motor vehicle loans

### Scope

This asset class contains loans made to entities or consumers to finance motor vehicles.

### Size of the portfolio

Motor vehicle loans consisted of an outstanding amount of EUR 49 million, which represented 0.04% of the Customer Finance Portfolio. The emissions coverage for Motor vehicle loans was 100%.

### Methodology

PCAF's methodology for Motor vehicle loans was used to estimate financed emissions for this asset class, which consist of the following formulas:

$$\text{Financed emissions} = \sum_v \text{Attribution factor}_v \times \text{Vehicle emissions}_v$$

(with v = vehicle or vehicle fleet)

$$\text{Attribution factor} = \frac{\text{Outstanding amount}_v}{\text{Total value at origination}_v}$$

(with v = vehicle or vehicle fleet)

$$\text{Vehicle emissions} = \text{Distance traveled}_v \times \text{Efficiency}_{v,f} \times \text{Emission factor}_f$$

(with v = vehicle or vehicle fleet, f = fuel type)



Motor vehicle loans	Description	Data source	Data quality score
Emissions	Emissions were estimated with an average distance travelled per vehicle and an emission factor for passenger vehicles per km.	Average distance travelled (6678 km): <a href="#">Statistics Finland</a>	5
	The average distance travelled per vehicle was obtained by dividing the total vehicles in traffic by the total vehicle-km in Finland (2022).	Emission factor: UK BEIS (obtained through license)	
Attribution	Outstanding amount: refers to the outstanding amount from each loan.	MuniFin	5
	Total value at origination: value of vehicle at origination	MuniFin	5

### Results and comparison with previous years

	2020	2021	2022
Outstanding Amount (mEUR)	33	38	49
Weight Across Funds (%)	0.1	0.12%	0.04
Analysed Amount (mEUR)	37.6	38	49
Coverage (%)	100	100	100
Financed Emissions (tCO <sub>2</sub> e / year)	642	663	835
Economic emission intensity (tCO <sub>2</sub> e / mEUR)	17	18	16.99
Data Quality Score	5	5	5

In 2022, data quality score for this asset class was 5, since activity data from vehicles was not available and had to be estimated.

#### Limitations

- This methodology usually considers vehicle and fuel type, since that data was unknown, vehicle emissions were calculated based on the data from an average vehicle in Finland (0.17 kgCO<sub>2</sub>e/km).
- Specific distance travelled for each vehicle was unknown, therefore an average distance was used (6678 km).

#### Assumptions

- Average distance travelled per vehicle in Finland was calculated using the total amount of kms driven divided by total number of vehicles in traffic, according to Statistics Finland.
- Emission factor from a passenger vehicle for an average size car with unknown fuel type was used.

# Liquidity portfolio

## Sovereign bonds

### Scope (what was included)

This asset class contains national government-issued debt security to raise capital for spending needs.

### Size of the portfolio

Sovereign bonds consisted of an outstanding amount of EUR 124 million, which represent 3.76% of the liquidity Portfolio. The emissions coverage for sovereign bonds was 100%.

### Methodology

PCAF's methodology for Sovereign debt was used to estimate financed emissions for this asset class. The approach considers the sovereign as a territory; emissions generated by a country's production, consumption and trade activity are attributed to the territory.

The calculation is based on the following formula:

$$\text{Financed emissions} = \sum_s \text{Attribution factor}_s \times \text{Sovereign emissions}_s$$

(with s = sovereign borrower)

Where the attribution factor is calculated as:

$$\text{Attribution factor} = \sum_s \frac{\text{Outstanding amount}_s}{\text{PPP-adjusted GDP}_s}$$

(with s = sovereign borrower)

ISIN codes were used to identify the sovereign associated with each government bond. Based on the available data, a relevant approach and underlying calculation formula based on PCAF's guidelines was selected. The formulas used in the analysis are shown below, along with the corresponding data quality score.

For a data quality score of 1:

$$\text{Financed emissions} = \sum_s \frac{\text{Outstanding amount}_s}{\text{PPP-adjusted GDP}_s} \times \text{Verified emissions}_s$$

(with s = sovereign borrower)

For a data quality score of 2:

$$\text{Financed emissions} = \sum_s \frac{\text{Outstanding amount}_s}{\text{PPP-adjusted GDP}_s} \times \text{Unverified emissions}_s$$

(with s = sovereign borrower)

Sovereign bonds	Description	Data source	Data quality score
Emissions	Emission data for verified and unverified emissions per sovereign was collected. A data quality score of 1 is assigned to data obtained from UNFCCC.  Unverified data was estimated by using an economic activity-based approach and is assigned data quality score 2.	Emissions data from United Nations Framework Convention on Climate Change (UNFCCC), Organisation for Economic Co-operation and Development (OECD) and OS-Climate	1/2
Attribution	Outstanding amount: refers to the outstanding amount from each bond.	MuniFin	
	PPP- adjusted GDP	The World Bank	

### Results and comparison with previous years

	2020 <sup>7</sup>	2021 <sup>8</sup>	2022
<b>Outstanding Amount (mEUR)</b>	254	174	124
<b>Weight Across Funds (%)</b>	5.8	4.7	3.8
<b>Analysed Amount (mEUR)</b>	254	174	124
<b>Coverage (%)</b>	100	100	100
<b>Financed Emissions (tCO<sub>2</sub>e / year)</b>	65,291	37,036	23,153
<b>Economic emission intensity (tCO<sub>2</sub>e / mEUR)</b>	258	214	187
<b>Data Quality Score</b>	2	2	2

### Limitations

- In 2020 and 2021, the draft Sovereign Bonds methodology from PCAF used a governmental or territorial approach. As the 2022 standard only includes a territorial approach, financed emissions in 2020 and 2021 were recalculated using this methodology, to ensure consistency and comparability with 2022 results.

<sup>7</sup> 2020 financed emissions were recalculated using a territorial approach.

<sup>8</sup> 2021 financed emissions were recalculated using a territorial approach.

## Listed bonds

### Scope

This asset class contains fixed income assets issued by Financial Institutions, Sovereigns, as well as Sovereign Agencies and Supranationals i.e., Corporate bonds, SSA bonds, Sovereign and Municipal bonds.

### Size of the portfolio

Listed bonds consisted of an outstanding amount of EUR 3,178 million, which represent 96.2% of the Investments (or Liquidity) Portfolio. The emissions coverage for listed bonds was 93.7%.

### Methodology

For Corporate and non-sovereign bonds, including Supranational and agencies bonds (or SSA bonds), PCAF methodology for listed equity and corporate bonds was used to calculate financed emissions. Financed emissions for listed bonds are calculated by multiplying the issuer's emissions with an attribution factor, to allocate the correspondent share of emissions:

$$\text{Financed emissions} = \sum_c \text{Attribution factor}_c \times \text{Company emissions}_c$$

(with  $c$  = borrower or investee company)

If emissions are not directly reported by the issuer or data is limited, estimations are made using averaged data such as industry proxies or EEIO data, using the same approach as business loans.

For Sovereign and Municipal bonds, it was decided to use the PCAF methodology for sovereign debt, from 2022 onward. For more information regarding the methodology, please refer to the above section on Sovereign debt.<sup>9</sup>

<sup>9</sup> Please refer to Sovereign debt for details on data quality scores and data sources for emission and attribution factors.

Listed bonds	Description	Data source	Data quality score
Emissions	Emissions reported by issuer counterparties.	Sustainability reports or CDP questionnaires	1/2
	Company emissions were estimated using sectoral emission factors provided in tCO <sub>2</sub> e per EUR of revenue per scope.	Built emission factors database. Stemming from OECD environmentally extended input-output dataset.	4/5
Attribution	Outstanding amount: refers to the outstanding amount from each loan.	MuniFin	1,2,4,5
	EVIC: enterprise value including cash reported by the issuer.	Financial reports	1,2,4
	Asset turnover ratio: financial metric to estimate the potential revenue generated with the outstanding amount. This ratio is based on sector/ industrial activity (sectoral approach).	Built asset turnover ratio database. Stemming from OECD environmentally extended input-output dataset	5

## Results and comparison with previous years

	2020 <sup>10</sup>	2021 <sup>11</sup>	2022
Outstanding Amount (mEUR)	3,890	3,296	3,178
Weight Across Funds (%)	89.8	89.2	96.2
Analysed Amount (mEUR)	3,890	3,165	2,982
Coverage (%)	100	96	94
Financed Emissions (tCO <sub>2</sub> e / year)	11,196	6,668	202,765 <sup>12</sup>
Economic emission intensity (tCO <sub>2</sub> e / mEUR)	3	2	68
Data Quality Score	- <sup>13</sup>	3.6	2.8

### Limitations

- Since some issuers did not report emissions, financed emissions for these issuers were calculated using averaged data which included data derived from environmentally extended input-output (EEIO) tables.
- In 2020 and 2021, the Sovereign Bonds methodology from PCAF used a governmental or territorial approach. In 2022, the methodology used only a territorial approach to reflect the latest updates from the PCAF Standard. Financed emissions were recalculated for 2020 and 2021 using a territorial approach.
- In 2022, Sovereign and Municipal bonds were calculated using the methodology of Sovereign Bonds. As such, the financed emissions from Municipal bonds are much higher than previous years, where such bonds were treated as financial industries under the GICS

sectors banks, professional services and insurance. The emission factors for banks, professional services and insurance are usually low as they do not encompass the scope 3 emissions of these entities.

- For instance, the bond with ISIN DE000A254N12 was associated with 7.33 tCO<sub>2</sub>e in financed emissions in 2021. Yet, in 2022, using the Sovereign Bond methodology and country-level emission factors, the same bond resulted in 5,909 tCO<sub>2</sub>e attributed to MuniFin.
- Changes in methodological factors make the year-on-year comparison of absolute financed emissions irrelevant.

### Assumptions

- To classify a bond as sovereign or non-sovereign the Bloomberg database was used to match the ISIN identification with corresponding asset class. The process involved mapping the bonds' ISIN with the industry classifications from Bloomberg to determine the calculation method.
  - "Sovereign bonds" were classified as Sovereign bonds.
  - "Multi-national or Government banks" were classified as SSA bonds.
  - "Government municipal or government state" were classified as Municipal bonds.
- Financed emissions from Sovereign and Municipal bonds were calculated using the Sovereign bond methodology. Financed emissions from SSA bonds were calculated using the PCAF methodology for listed equity and corporate bonds.

<sup>10</sup> In 2020, Corporate and SSA/Municipal bonds were accounted for separately. Corporate bonds accounted for 404tCO<sub>2</sub>e financed emissions, while SSA/Municipal bonds were responsible for 10,792tCO<sub>2</sub>e.

<sup>11</sup> In 2021, Corporate and SSA/Municipal bonds were accounted for separately. Corporate bonds accounted for 631tCO<sub>2</sub>e financed emissions, while SSA/Municipal bonds were responsible for 6,057tCO<sub>2</sub>e.

<sup>12</sup> Absolute emission figure for Listed bonds can be subdivided as follows: Corporate bonds account for 246 tCO<sub>2</sub>e, SSA bonds account for 61 tCO<sub>2</sub>e, Sovereign bonds account for 69,608 tCO<sub>2</sub>e, and Municipal bonds account for 131,334 tCO<sub>2</sub>e.

<sup>13</sup> Weighted average data quality score of Corporate bonds is equal to 3.5 Weighted average data quality score of SSA/Municipal bonds is equal to 5.

### **Green bonds**

The PCAF Standard does not offer specific instructions for calculating financed emissions for all financial products. This includes green bonds and other similar instruments. Green bonds were therefore excluded from the calculation.

### **Cash**

A significant amount of MuniFin's liquidity portfolio are cash deposits. The total liquidity including cash at the end of 2022 was EUR 11 756 million. During the 2020 accounting exercise, cash holdings were deemed to contribute zero emissions, primarily stemming from the assumption that these funds were not allocated towards any specific emissions-generating activities.

However, in 2021 and 2022, the calculations excluded cash holdings from the emissions assessment due to the absence of a dedicated methodology to accurately measure emissions associated with cash.

Nevertheless, emerging studies have highlighted the potential relevance of factoring in cash holdings in emissions analyses, recognizing the indirect environmental impact that might arise from the allocation of these funds. Despite the methodological challenge, the consideration of cash in emissions evaluations is an evolving area of interest, acknowledging its potential influence on the overall carbon footprint.

### **Derivative contracts**

The PCAF Standard does not offer specific instructions for calculating financed emissions for all financial products. This includes derivatives (such as futures, options, swaps) and other similar instruments. Derivatives were therefore excluded from the calculation.



# Updates from past years

## Municipal loans

PCAF launched in December 2022 the 2nd version of the Global GHG Accounting and Reporting Standard for the Financial Industry. The 2nd version of the Standard includes an update on measuring and reporting financed emissions, a method for sovereign debt, and guidance to account for emission removals. The new method for sovereign debt does not include sub-sovereign or municipal debt, however this was the methodology that was considered as a base for this asset class.

Previous years' financed emissions were estimated with draft methodologies from PCAF. Past methodologies proposed a governmental and a territorial approach. Since PCAF decided to retain the territorial approach the financed emissions from municipal loans in 2020 and 2021 were recalculated following the territorial approach.

Municipal loans results were therefore estimated using the territorial approach. This approach is based on PCAF's sovereign debt methodology, adapted to municipalities. The following formula is proposed by PCAF to estimate financed emissions for sovereign debt and it was adapted to municipalities as follows:

$$\text{Financed emissions} = \sum_m \text{Attribution factor}_m \times \text{Municipality emissions}_m$$

(with  $m$  = municipal borrower)

$$\text{Financed emissions} = \sum_m \frac{\text{Outstanding amount}_m}{\text{PPP-adjusted GDP}_m} \times \text{Municipality emissions}_m$$

(with  $m$  = municipal borrower)

# Appendix I: Data Quality Score

## Municipal loans

Data quality score calculation for municipal loan was based on the sovereign debt methodology, as follows:

(score 1 = highest data quality, score 5 = lowest data quality)

Data Quality	Options to estimate the financed emissions	When to use each option	
Score 1	Option 1: Reported emissions	1a	Verified GHG emissions of the country are available. These GHG emissions are reported by the country itself and can be extracted from UNFCCC <sup>181</sup>
		1b	Unverified emissions of the country are available.
Score 2	Option 2: Physical activity based emissions	2a	Reported GHG emissions of the country are not known. Emissions are calculated using primary physical activity data of the country's energy consumption (domestic generated and imported) and emission factors specific to that primary data.
Score 3		3a	Reported GHG emissions of the country are not known. Emissions are calculated using sectoral revenue data of the country's production and emission factors specific to that revenue data.
Score 4	Option 3: Economic activity based emissions	3a	Reported GHG emissions of the country are not known. Emissions are calculated using sectoral revenue data of the country's production and emission factors specific to that revenue data.
Score 5		3b	Country GHG emissions are estimated by taking a proxy. GHG emissions from (a) similar (climate (zones), wealth, GDP) country are taken to estimate the country GHG emissions.

### Business loans

(score 1 = highest data quality, score 5 = lowest data quality)

Data Quality	Options to estimate the financed emissions	When to use each option
Score 1	<b>Option 1: Reported emissions</b>	<b>1a</b> Outstanding amount in the company and total company equity plus debt are known. <b>Verified emissions</b> of the company are available.
		<b>1b</b> Outstanding amount in the company and total company equity plus debt are known. <b>Unverified emissions</b> calculated by the company are available.
Score 2	<b>Option 2: Physical activity-based emissions</b>	<b>2a<sup>102</sup></b> Outstanding amount in the company and total company equity plus debt are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data for the company's energy <b>consumption</b> and emission factors <sup>103</sup> specific to that primary data. Relevant process emissions are added.
		<b>2b</b> Outstanding amount in the company and total company equity plus debt are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data for the company's <b>production</b> and emission factors specific to that primary data.
Score 3		
Score 4	<b>Option 3: Economic activity-based emissions</b>	<b>3a</b> Outstanding amount in the company, total company equity plus debt, and the <b>company's revenue<sup>104</sup></b> are known. Emission factors for the sector per unit of revenue are known (e.g., tCO <sub>2</sub> e per euro or dollar of revenue earned in a sector).
		<b>3b</b> Outstanding amount in the company is known. Emission factors for the sector per unit of asset (e.g., tCO <sub>2</sub> e per euro or dollar of asset in a sector) are known.
Score 5		<b>3c</b> Outstanding amount in the company is known. Emission factors for the sector per unit of revenue (e.g., tCO <sub>2</sub> e per euro or dollar of revenue earned in a sector) and <b>asset turnover ratios</b> for the sector are known.

### Real estate related loans

(score 1 = highest data quality, score 5 = lowest data quality)

Data Quality	Options to estimate the financed emissions	When to use each option
Score 1	Option 1: Actual building emissions	1a Primary data on <b>actual building energy consumption</b> (i.e., metered data) is available. Emissions are calculated using actual building energy consumption and <b>supplier-specific emission factors</b> <sup>153</sup> specific to the respective energy source.
Score 2		1b Primary data on <b>actual building energy consumption</b> (i.e., metered data) is available. Emissions are calculated using actual building energy consumption and <b>average emission factors</b> specific to the respective energy source.
Score 3	Option 2: Estimated building emissions based on floor area	2a <b>Estimated building energy consumption per floor area based on official building energy labels AND the floor area</b> are available. Emissions are calculated using estimated building energy consumption and <b>average emission factors</b> specific to the respective energy source.
Score 4		2b <b>Estimated building energy consumption per floor area based on building type and location-specific statistical data AND the floor area</b> are available. Emissions are calculated using estimated building energy consumption and <b>average emission factors</b> specific to the respective energy source.
Score 5	Option 3: Estimated building emissions based on number of buildings	3 <b>Estimated building energy consumption per building based on building type and location-specific statistical data AND the number of buildings</b> are available. Emissions are calculated using estimated building energy consumption and <b>average emission factors</b> specific to the respective energy source.

### Motor vehicle loans

(score 1 = highest data quality, score 5 = lowest data quality)

Data Quality	Options to estimate the financed emissions	When to use each option	
Score 1	Option 1: Actual vehicle-specific emissions	1a	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Primary data on <b>actual vehicle fuel consumption</b> is available. Emissions are calculated using actual fuel consumption and fuel type-specific emission factors.
		1b	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are available from <b>known vehicle make and model</b> . <sup>166</sup> Primary data on <b>actual vehicle distance</b> traveled is available. Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.
Score 2	Option 2: Estimated vehicle-specific emissions	2a	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are available from <b>known vehicle make and model</b> . <b>Distance traveled is estimated based on local statistical data</b> . <sup>167</sup> Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.
Score 3		2b	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are available from <b>known vehicle make and model</b> . <b>Distance traveled is estimated based on regional statistical data</b> . <sup>168</sup> Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.
Score 4	Option 3: Estimated vehicle-unspecific emissions	3a	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are estimated from <b>known vehicle type</b> (vehicle make and model are unknown). <sup>169</sup> <b>Distance traveled is estimated based on local or regional statistical data</b> . Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.
Score 5		3b	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are estimated for an <b>average vehicle</b> (vehicle make and model and vehicle type are unknown). <sup>170</sup> <b>Distance traveled is estimated based on local or regional statistical data</b> . Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.

### Sovereign bonds

(score 1 = highest data quality, score 5 = lowest data quality)

Data Quality	Options to estimate the financed emissions	When to use each option
Score 1	Option 1: Reported emissions	1a Verified GHG emissions of the country are available. These GHG emissions are reported by the country itself and can be extracted from <a href="#">UNFCCC</a> <sup>181</sup>
Score 2		1b Unverified emissions of the country are available.
Score 3	Option 2: Physical activity based emissions	2a Reported GHG emissions of the country are not known. Emissions are calculated using primary physical activity data of the country's energy consumption (domestic generated and imported) and emission factors specific to that primary data.
Score 4	Option 3: Economic activity based emissions	3a Reported GHG emissions of the country are not known. Emissions are calculated using sectoral revenue data of the country's production and emission factors specific to that revenue data.
Score 5		3b Country GHG emissions are estimated by taking a proxy. GHG emissions from (a) similar (climate (zones), wealth, GDP) country are taken to estimate the country GHG emissions.

### Listed bonds

(score 1 = highest data quality, score 5 = lowest data quality)

Data Quality	Options to estimate the financed emissions	When to use each option
Score 1	<b>Option 1: Reported emissions</b>	<b>1a</b> Outstanding amount in the company and EVIC are known. <b>Verified emissions</b> of the company are available.
		<b>1b</b> Outstanding amount in the company and EVIC are known. <b>Unverified emissions</b> calculated by the company are available.
Score 2	<b>Option 2: Physical activity-based emissions</b>	<b>2a<sup>69</sup></b> Outstanding amount in the company and EVIC are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data of the <b>company's energy consumption</b> and emission factors <sup>70</sup> specific to that primary data. Relevant process emissions are added.
		<b>2b</b> Outstanding amount in the company and EVIC are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data of the <b>company's production</b> and emission factors specific to that primary data.
Score 3		
Score 4		
Score 5	<b>Option 3: Economic activity-based emissions</b>	<b>3a</b> Outstanding amount in the company, EVIC, and the <b>company's revenue<sup>71</sup></b> are known. Emission factors for the sector per unit of revenue are known (e.g., tCO <sub>2</sub> e per euro or dollar of revenue earned in a sector).
		<b>3b</b> Outstanding amount in the company is known. Emission factors for the sector per unit of asset (e.g., tCO <sub>2</sub> e per euro or dollar of asset in a sector) are known.
		<b>3c</b> Outstanding amount in the company is known. Emission factors for the sector per unit of revenue (e.g., tCO <sub>2</sub> e per euro or dollar of revenue earned in a sector) and <b>asset turnover ratios</b> for the sector are known.

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