Finance Norway

Guidelines for calculating financed emissions

Photo: Walaiporn Sangkeaw

Foreword

The financial services industry is vital to the transition to a low-emission society. How we lend, invest and insure, together with the advice we provide to our customers, largely determine which businesses and projects gain access to capital. We are often critical in deciding which buildings are constructed, which technology projects are carried out, and which new businesses emerge.

Proper risk pricing has always been a core task of the financial services industry. This is an important part of our societal mission and something we excel at. We aim to participate in risk allocation and ensure that capital is channelled into projects with the highest risk-adjusted returns. In order to continue delivering on this societal mission in a world where greenhouse gas emissions are to be significantly reduced, the financial services industry is reliant on access to relevant data.

Many institutions in the Norwegian financial services industry have already begun calculating the volume of greenhouse gas emissions they finance, so-called financed emissions. Calculating such financed emissions can help financial institutions comply with current or future regulatory requirements. These calculations can also be used in risk assessments and other internal processes, such as setting targets for reducing greenhouse gas emissions.

In order for the calculations to be useful for individual financial institutions and society as a whole, the figures must be comparable – both over time and between different actors. The aim of these guidelines is to serve as a tool for financial institutions that wish to calculate financed emissions and contribute to standardising how Norwegian financial institutions calculate financed emissions across the industry.

These guidelines are a starting point and not a final destination. Finance Norway's ambition is to continue updating and developing these guidelines in line with the needs of our members and international developments in the field.

More than 30 individuals with diverse expertise from Finance Norway's member banks and life insurance companies have been involved in the development of these guidelines. I would like to express my sincere gratitude to all those involved who enthusiastically contributed their valuable insights throughout the process.

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Additionally, many contributors have had large teams supporting them, providing valuable expertise in various asset classes and sectors.

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About these guidelines

Purpose and objectives

These guidelines have been developed by the administration of Finance Norway in collaboration with several members of Finance Norway. The purpose of these guidelines is to contribute to standardising how Norwegian financial institutions calculate their financed emissions by consolidating information related to calculation methods, data sources and assumptions in one easily accessible document.

The objectives of this standardisation are to:

1) Increase the number of financial institutions in Norway reporting financed emissions.
2) Improve the quality of calculations of financed emissions.
3) Improve the comparability of financed emissions across the Norwegian financial services industry.

To achieve the abovementioned objectives, Finance Norway has strived to make these guidelines as specific and practical as possible. These guidelines therefore include a large number of data sources that financial institutions can use to calculate their financed emissions. Finance Norway hopes that this will help lower the threshold for financial institutions to calculate their financed emissions.

The Partnership for Carbon Accounting Financials (PCAF) is the authoritative standard for calculating financed emissions.[1] It is based on the Greenhouse Gas Protocol (GHG Protocol), and the latest version of the PCAF standard was launched in December 2022. It is important to clarify that these guidelines are based on PCAF's methodology for calculating financed emissions and is a supplement to, not a replacement for, the PCAF standard.

Finance Norway recommends using these guidelines, along with the PCAF standard, when calculating financed emissions, but emphasises that this is voluntary. Furthermore, we recommend anyone using these guidelines to be transparent about areas where their method of calculating financed emissions deviates from these guidelines and the PCAF standard.

A significant part of the work on these guidelines involved identifying reliable national data sources to improve the data quality for calculating financed emissions. Norway has several reliable public sources of data, such as Statistics Norway (SSB), the Norwegian Environment Agency, the Norwegian Water Resources and Energy Directorate (NVE) and Enova.

By identifying high-quality data sources and establishing sector-wide assumptions for the calculations, these guidelines aim to improve the quality of financial institutions' calculations of financed emissions and improve the comparability of the calculations across the financial services industry.

To the best of our ability, these guidelines clarify national circumstances that necessitate specific interpretations of the PCAF standard. It also highlights differences between the recommendations in the PCAF standard and these guidelines. The guidelines can be used as a reference for potential national data sources that financial institutions can utilise in their calculations of financed emissions. The use of these data sources is voluntary, and financial institutions are encouraged to use the best available data at all times.

Regulatory requirements for reporting financed emissions are forthcoming. It is also expected that more detailed guidance will be provided by internationally influential entities such as the European Supervisory Authorities (ESAs) and the International Sustainability Standards Board (ISSB). It is likely that this will lead to increased standardisation of the method for calculating financed emissions, but there will still be a need for reliable data sources, as identified in these guidelines. Finance Norway's ambition is to continue updating and developing these guidelines in line with the needs of our members and international developments in the field.

1) PCAF – Partnership for Carbon Accounting Financials, Financed emissions

How these guidelines are structured

These guidelines are largely structured in the same way as the PCAF standard.

The PCAF standard defines six asset classes, in addition to sovereign debt. The first three asset classes (1–3) in PCAF are general, while the last three asset classes (4-6) specify three different forms of financing where capital is tied to specific purposes (*"known use of proceeds"*). These guidelines define the same asset classes as PCAF, except for sovereign debt.[2] These guidelines also introduce a new asset class where capital is tied to specific purposes, shipping, in the same manner as the Framework for Financed Emissions Accounting published by Finance Denmark and Insurance & Pension Denmark.[3] The shipping asset class can be considered a special case within the project finance asset class.

In addition, these guidelines provide sector-specific recommendations for agriculture, aquaculture, and oil and gas. These three sector-specific recommendations include sector-specific clarifications and suggestions for data sources and should be used in conjunction with the first three asset classes.

Structure of these guidelines

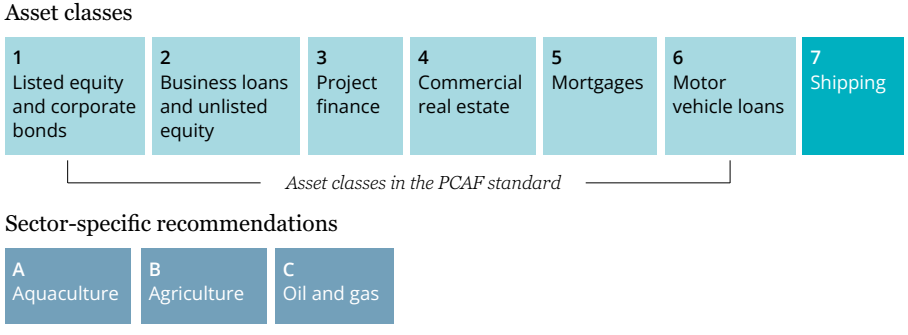


***Figure 1** – Structure of these guidelines.*

The first three asset classes are explained briefly, as they are more general than the following four. The guidelines provide more detailed descriptions of the commercial real estate, mortgages, motor vehicle loans and shipping asset classes, as well as sector-specific recommendations, including suggestions for data sources.

Example of how to use these guidelines

A financial institution has invested in a small unlisted oil company that does not report on Scope 3 emissions. The financial institution can find guidance on how to estimate the oil company's Scope 3 emissions in the sector-specific recommendations for oil and gas. The method for how the financial institution calculates the value of its own exposure, as well as the value of the company, can be found in the asset class business loans and unlisted equity.

What is PCAF (Partnership for Carbon Accounting Financials)?

PCAF is an initiative led by the financial services industry itself aimed at standardising the calculation and reporting of financed emissions. PCAF was created by Dutch financial institutions in 2015 and has since become a dominant player on the global stage.

The PCAF standard consists of three different parts: financed emissions,[4] facilitated emissions (not yet publicly available) and insurance-associated emissions.[5] These guidelines consistently refer to the part on financed emissions as the "PCAF standard".

As of March 2023, PCAF's members counted over 370 financial institutions, with a combined total of more than USD 88 trillion in assets under management. Sixteen of these financial institutions are Norwegian.

The PCAF standard is built on the GHG Protocol, and the GHG Protocol has reviewed the PCAF standard to ensure compliance with the requirements of the *"Corporate Value Chain (Scope 3) Accounting and Reporting Standard"* for category 15, loans and investments.[6]

2) Sovereign debt is not discussed in these guidelines, as PCAF introduced this update late in our process, but it may possibly be included in later versions.
3) Finance Denmark and Insurance & Pension Denmark – Framework for Financed Emissions Accounting

4) PCAF – Financed emissions, The global GHG accounting and reporting standard
5) PCAF – Insurance-associated emissions, The global GHG accounting and reporting standard
6) Greenhouse Gas Protocol – Corporate Value Chain (Scope 3) Accounting and Reporting Standard

In December 2022, PCAF Nordic was established as a regional group for PCAF members with the purpose of, among other things:

- Seeking harmonisation of various Nordic initiatives in close contact with the PCAF Secretariat.
- Seeking common Nordic emission factors where possible.
- Increasing awareness of, and access to, high-quality data sources.
- Being a Nordic voice within PCAF's working group for the development of the PCAF database, working to enhance data quality.

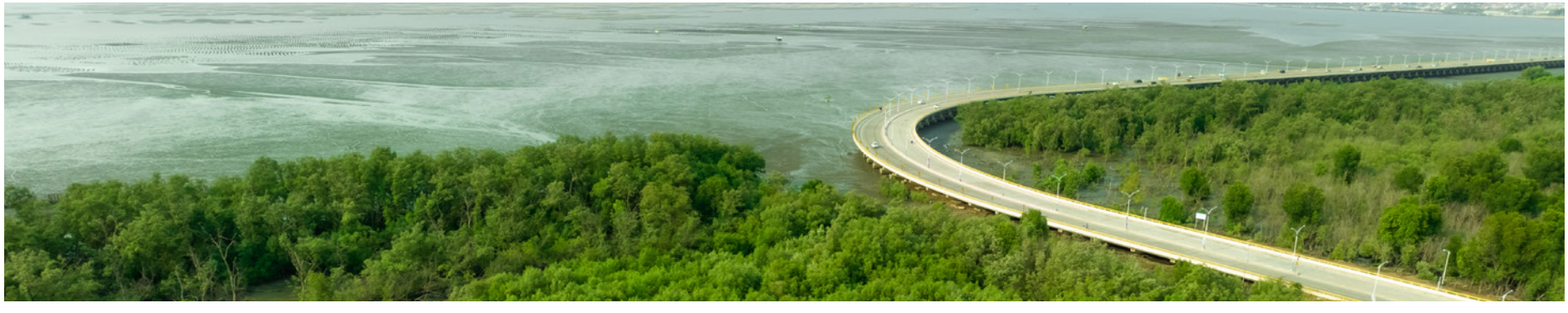
Several of Finance Norway's members are full members of PCAF Nordic, and Finance Norway acts as an observer.

There are several regulatory initiatives that require the calculation of financed emissions, including TCFD (Task Force on Climate-related Financial Disclosure)[7] and Pillar 3 requirements for the largest banks.[8] It is not a specific requirement to use the PCAF standard to calculate financed emissions to meet these regulatory requirements, but PCAF is mentioned by various regulatory initiatives, for instance the European Sustainability Resporting Standard (ESRS) E1, as a method that kan be used. It is Finance Norway's understanding that PCAF is the leading standard in this field.

Disclaimer

Finance Norway has produced these guidelines for the members of Finance Norway. These guidelines have been written to the best of our abilities and aim to lower the threshold for Norwegian financial institutions to calculate financed emissions, while also contributing to increasing the quality and comparability of calculations. Calculating financed emissions is a rapidly evolving field, and these guidelines provide a "best effort" snapshot from Finance Norway in spring 2023. These guidelines do not impose obligations or prohibitions on the members of Finance Norway. The guidelines refer to various sources, but Finance Norway does not assume responsibility for their accuracy or how they are updated. As of the time of writing, Finance Norway is not aware of any contradictions between these guidelines and regulatory requirements. However, it is important to note that these guidelines do not provide advice on how to comply with regulatory requirements.

These guidelines are a work in progress and not a finished product. This means that Finance Norway and the members of Finance Norway may wish to revise these guidelines, for instance by including more asset classes and/or more data sources and by clarifying calculation methods in challenging and complex structures.



7) TCFD – Implementing the Recommendations of the TCFD
8) (EU) 2022/2453 – Pillar 3

About financed emissions – and why this is important

What calculations of financed emissions are – and what they are not

According to the GHG Protocol, a company's greenhouse gas emissions are divided into three parts. Put simply, emissions where the company has operational control are considered Scope 1, indirect emissions related to purchased energy are considered Scope 2, and other indirect emissions upstream or downstream in the value chain are considered Scope 3.

Financed emissions fall under the GHG Protocol's Scope 3, subcategory 15 – loans and investments. Scope 3 emissions are emissions indirectly associated with a financial institution's activities and are beyond the direct control of the financial institution.

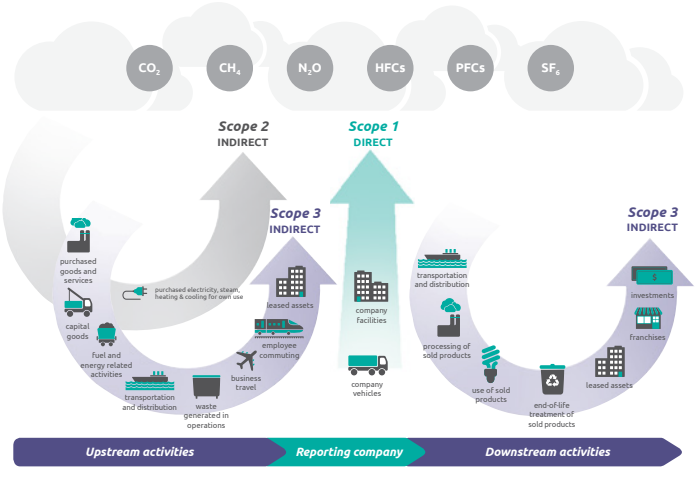


Figure 2 – Companies' greenhouse gas emissions are categorised into Scope 1, Scope 2 and Scope 3.[9]

In the same way that financial statements provide an overview of a company's financial situation for the past year, a calculation of financed emissions serves as an account of emissions that have occurred in financed activities over a year, weighted based on how much of the respective activity the financial institution has financed. Calculating and reporting financed emissions enables financial institutions and stakeholders to understand the amount of emissions that financial institutions are financing. This allows for tracking historical developments for individual financial institutions and for comparing different financial institutions.

It's important to note that the PCAF standard and these guidelines are not designed to provide advice on how financial institutions should set emission reduction targets, or how they should develop strategies and make decisions to reach their targets. These guidelines solely serve as a tool to help financial institutions gain insights into financed emissions. Many financial institutions use various target-setting frameworks and may be part of different target-setting initiatives, such as Science Based Targets Initiative. PCAF and these guidelines complement these target-setting initiatives.

Climate risk is divided into three categories: physical climate risk, transition risk and liability risk. Transition risk is the most relevant in the context of financed emissions, as it relates to changes in regulations, technology, markets and reputation during the transition to a low-emission society.

Calculating financed emissions can be one component of assessing a financial institution's transition risk. It's essential to emphasise that calculating financed emissions should be integrated with other analyses to provide a comprehensive picture of financial climate risk. For instance, two companies operating in different parts of the world but otherwise identical may have different climate risks because the likelihood of increased pricing of greenhouse gas emissions could vary by location. Similarly, companies with identical total emissions and identical financing – in other words, identical financed emissions – may have different climate risks. This could be due to one company operating in a sector where it is challenging to reduce emissions, while the other operates in a sector where cost-effective low-emission solutions already exist.

9) GHG Protocol – Corporate Value Chain (Scope 3) Accounting and Reporting Standard

Greenhouse gas emissions and calculation of CO_2 equivalents (carbon dioxide equivalents, CO_2e)

There are many different gases that contribute to global warming. To compare the impact of various greenhouse gases on global warming, it is common to use the Global Warming Potential 100 (GWP-100, or usually just GWP). This is a ratio that represents the effect of a particular greenhouse gas on global warming over a one-hundred-year period compared to CO_2. The conversion to CO_2 equivalents is obtained by multiplying the amount of emissions of the gas in question by the GWP.

In the Kyoto Protocol, there are seven gases referred to as greenhouse gases. These seven gases are listed in the table below. The GWP values are taken from the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report.[10]

Name	Chemical formula	GWP 100
Carbon dioxide	CO_2	1
Methane	CH_4	27.9
Nitrous Oxide	N_2O	273
Hydrofluorocarbons (HFCs), factor applies to HFC-32	CH_2F_2	771
Perfluorocarbons (PFCs), factor applies to PFC-14	CF_4	7380
Nitrogen trifluoride	NF_3	17 400
Sulphur hexafluoride	SF_6	24 300

***Table 1** – Greenhouse gasses and their GWP 100.*

10) IPCC – The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity – Supplementary Material

11) As financial institutions rely on reporting from the companies for which they have outstanding amounts, and as this reporting often coincides with the reporting of financed emissions, financial institutions will often use reporting from underlying companies from the year prior to the impact. For example, financial institutions may assess the value of their exposure to a company as at 31 December 2022, but use emissions data from the company's 2022 report for the year 2021.

Principles for calculating financed emissions

Finance Norway has identified seven principles that financial institutions should follow when calculating financed emissions:

1. Calculations of financed emissions should be transparent

Financial institutions should be transparent about their choice of method, limitations, sources, assumptions and changes when calculating financed emissions. If financial institutions use methods that deviate from PCAF and/or these guidelines, this should be clearly stated in their reporting. Financial institutions should be transparent about which greenhouse gases are included in their calculations for different asset classes and sectors. If financial institutions change their method, source and/or limitations from one year to another, this should be clearly stated to the extent possible, preferably with an explanation of the impact on the calculations.

2. Calculations of financed emissions should be accurate

Financial institutions should strive to calculate financed emissions with the highest possible degree of accuracy and use the latest available data, even if this results in different timeframes for the emissions related to the outstanding amount and the financial institution's financial exposure.[11]

Financial institutions should use data of the highest possible data quality to calculate their financed emissions. Over time, financial institutions should aim to move up PCAF's Data hierarchy (see descriptions of the different asset classes and sector-specific recommendations). Data quality should be reported both overall and by asset class. Financial institutions may report data quality at a more granular level, such as by sector.

3. Calculations of financed emissions should be clear

Financed emissions should always cover Scope 1 and Scope 2 emissions related to their exposures. These guidelines recommend that financial institutions follow PCAF's gradual inclusion of Scope 3 emissions for their exposures. If financial institutions also include Scope 3 emissions for their exposures, they should be separately disclosed. Calculations of emissions in Scope 3, subcategory 13, leased assets, should be disclosed separately from financed emissions. If financial institutions report emission removals and/or avoided emissions, they should be disclosed separately from other calculations.

4. Calculations of financed emissions should be disclosed annually

Financial institutions should report their financed emissions at least annually. Reporting should indicate the time period for the emissions data for the exposures, as well as the date of the financial exposure.[12] Time discrepancies due to the collection of emissions information from underlying companies should be explained.

5. Financial institutions should work to ensure that calculations of financed emissions are complete

Financial institutions should strive to include all their relevant portfolios in their calculations of financed emissions. Financial institutions should report the percentage of portfolios for which they have calculated financed emissions and which parts are not included in their calculations. If financial institutions report financed emissions only for certain asset classes or sectors, they should prioritise asset classes and sectors with high greenhouse gas emissions, for which they have significant outstanding amounts and the ability to obtain high-quality data.

6. Calculations of financed emissions should include intensity calculations

Financed emissions are influenced by several factors other than the emissions of underlying companies. We therefore recommend that financial institutions include economic intensity calculations for all asset classes, such as emissions per NOK million lent or invested. For some asset classes, we recommend that financial institutions also include physical intensity calculations, such as energy consumption per unit of floor area, i.e. kWh/m^2.

7. Financed emissions should be proportional to financial institutions' actual outstanding amount relative to the total value of the underlying activity

When calculating of financed emissions, financial institutions should use actual loans and investments and should not include, for example, unused credit facilities. Calculations that include unused credit facilities can be used for purposes such as internal risk assessments. However, if financial institutions disclose these calculations, they should be clearly separated from other calculations of financed emissions.

12) Companies subject to the Sustainable Finance Disclosures Regulation (SFDR) may wish to calculate their financed emissions in the same way as specified in SFDR (an average of impacts on 31 March, 30 June, 30 September and 31 December). EU 2022/1288, Art. 6(3).

Example of calculating financed emissions

A financial institution has a loan to a corporate customer of NOK 100 million as at 31 December 2022.On the reporting date, this company had an Enterprise Value Including Cash (EVIC) of NOK 1 billion, and in 2022, they reported emissions of 100,000 tonnes of CO_2e for the year 2021. The financial institution calculates the attribution factor for 31 December 2022, but uses the company's reported emissions for 2021.

$$\text{Attribution factor}_{31.12.2022} = \frac{\text{NOK 100 million}_{31.12.2022}}{\text{NOK 1000 million}_{31.12.2022}} = \mathbf{0.1}$$

$\text{Financed emissions}_{2022} = \text{Attribution factor}_{31.12.2022} \times \text{Company's emissions}_{2021}$

$= 0.1 \times 100\,000 \text{ tonnes } CO_2e = \mathbf{10\,000\ CO_2e}$

General information on data and data quality

In order to calculate financed emissions, financial institutions rely on information about the emissions generated by their customers or investments.

Many of the companies and activities that financial institutions invest in or lend money to do not report on emissions. This creates a need to use data of varying quality when calculating emissions.

The calculation of underlying emissions included in financed emissions can be categorised into three categories (ranked from highest to lowest data quality):

1. Emissions reported by the underlying companies themselves (PCAF data quality scores 1 and 2).
2. Emissions calculated using physical factors such as energy consumption, the quantity of goods produced or similar metrics (PCAF data quality score 3).
3. Emissions calculated based on economic activity, such as emissions per revenue or per on-balance sheet value (PCAF data quality scores 4 and 5).

Several international databases, including PCAF's database, largely rely on average emissions per revenue or per on-balance sheet value for a given sector in a specific geographical location. Emission factors based on economic activity include data that is low on PCAF's own data hierarchy (PCAF data quality scores 4 and 5). In addition to economic activity-based emission factors, PCAF also uses physical activity-based emission factors for some sectors, such as emissions per square meter of commercial buildings and residential housing.

These guidelines provide suggestions for various data sources that can help financial institutions move from category 3 (PCAF data quality scores 4 and 5) to category 2 (PCAF data quality score 3), see Table 2, "*Generic data hierarchy*".

As a general rule, financed emissions should always include the Scope 1 and Scope 2 emissions of the exposures. For exposures to certain sectors, such as oil and gas, financial institutions should also report on the Scope 3 emissions of the exposures. When reporting on Scope 3 emissions, they should be clearly distinguished from Scope 1 and Scope 2 emissions. For exposures to sectors where PCAF is not explicit about financial institutions reporting on Scope 3 emissions, disclosure is voluntary. Identifying high-quality data sources for Scope 3 emissions has proven to be a significant challenge.

Data quality	Calculation method	Alt.	Variable
1	Emissions reported by the company	1a	Verified, reported emissions
2		1b	Reported, unverified emissions
2	Calculated physical activity-based emissions	2a	Calculated emissions based on energy consumption and associated emission factors
3		2b	Calculated emissions based on production data and associated emission factors
4	Calculated economic activity-based emissions	3a	Calculated emissions based on company revenue and sector-specific emission factors per revenue
5		3b	Calculated emissions based on company on-balance sheet values and sector-specific emission factors per unit of value

***Table 2** – Generic data hierarchy*

Example of calculating weighted data quality

A financial institution will have access to data of varying quality for different asset classes and sectors. To demonstrate to stakeholders what data quality is available, it is important for the financial institution to report weighted data quality both overall and by asset class. The financial institution may also choose to report weighted data quality at the sector level.

$$\text{Weighted data quality score for a portfolio} = \frac{\sum_{i=1}^{n} \text{Outstanding amount}_i \times \text{Data quality score}_i}{\sum_{i=1}^{n} \text{Outstanding amount}_i}$$

Asset class	Sector	Company	Outstanding amount [NOK mill]	GHG emissions scope 1 & 2*	Data source	Data quality score
Business loan	A	Agriculture	5	2	Climate Calculator from Landbrukets Klimaselskap SA	2
Business loan	B	Agriculture	1	3	Climate Calculator from Landbrukets Klimaselskap SA	2
Business loan	C	Agriculture	10	10	Factors based on these guidelines	3
Business loan	D	Shipping	100	30	Verified self-reporting	1
Business loan	E	Shipping	200	20	Unverified self-reporting	2
Business loan	F	Shipping	30	5	Estimated based on distance sailed	3

* Thousand tonnes of CO_2 *1= hight 5=low*

***Table 3** – Calculating weighted data quality*

Weighted data quality score for business loans:

$$\frac{(5\,000\,000*2)+(1\,000\,000*2)+(10\,000\,000*3)+(100\,000\,000*1)+(200\,000\,000*2)+(30\,000\,000*3)}{5\,000\,000+1\,000\,000+10\,000\,000+100\,000\,000+200\,000\,000+30\,000\,000} = 1.827$$

Weighted data quality score for agriculture:

$$\frac{(5\,000\,000*2)+(1\,000\,000*2)+(10\,000\,000*3)}{5\,000\,000+1\,000\,000+10\,000\,000} = 2.625$$

Sources of errors and weaknesses

Calculating financed emissions is not an exact science. There will be areas where it's possible to argue for using different assumptions, data sources or limitations than those suggested in these guidelines. These guidelines do not provide a definitive answer on how all such trade-offs should be made, but we provide recommendations in most such cases for two reasons: to lower the threshold for financial institutions to report financed emissions and to increase comparability across the financial services industry.

The calculation of financed emissions consists of three factors: i) the financial institution's exposure to the company, project or asset, ii) the value of the company, project or asset, and iii) the emissions produced by the company, project or asset.

Regarding the financial institution's exposure to a company, project or asset, the financial institution usually has access to accurate data. However, there will be more uncertainties in the calculations for the other two factors.

The value of the company, project or asset

The PCAF standard considers equity and debt in a company, project, or asset to be equally important. This allows financial institutions to use the PCAF standard for investments in equity, corporate bonds and business loans.

For most asset classes, the PCAF standard recommends that financial institutions use Enterprise Value Including Cash (EVIC) to represent the company's value. EVIC includes both equity and debt and is used, among other things, in the EU's complementary provisions on reference values for climate adaptation (EU Climate Transition Benchmarks and EU Paris-aligned Benchmarks).[13]

The market value of a company's shares is a part of the EVIC. This part will fluctuate with several factors such as inflation, multiple expansions and other conditions that lenders or investors cannot influence. It can be affected by factors such as inflation, multiple expansions and other conditions that lenders or investors cannot influence. Setting a target of having an annual percentage reduction in financed emissions, for example, thus becomes a moving target. Nevertheless, EVIC is considered the best measure of the value of a company, project or asset. In the latest version of the PCAF standard, methods are proposed that financial institutions can use to try to correct for certain external factors that financial institutions cannot influence, and it is expected that PCAF will further develop these methods over time. However, both PCAF and these guidelines are clear that financial institutions reporting financed emissions must report unadjusted figures, and that it is voluntary to report adjusted figures. If financial institutions report adjusted figures, they should be clearly separated from the unadjusted figures, and the method and assumptions should be clearly stated.

For some asset classes, the PCAF standard recommends using the on-balance sheet values instead of EVIC. This is for asset classes where financial institutions do not have access to company value. Especially for banks, it can be challenging to access EVIC for smaller customers. As the value of a company, project or asset is in the denominator of the attribution factor, and EVIC will generally be higher than the on-balance sheet values, using on-balance sheet values will generally result in an overestimation of financed emissions.

These guidelines state that financial institutions should be transparent about what they have used to measure the value of a company, project or asset in their reporting.

Emissions produced by a company, project or asset

Identifying the company, project or asset

Norwegian companies are registered in the Brønnøysund Register with industry codes, often referred to as NACE codes. These industry codes are intended to show the company's primary business activity. However, experience from Finance Norway's members shows that many Norwegian companies are registered under an industry code that does not accurately represent their current primary business activity. This creates challenges for financial institutions that want to link industry codes with industry- and region-based average emission factors.

Estimating emissions from a company, project or asset

If financial institutions do not have access to specific emissions data for a company, project or asset, they must estimate emissions from their exposures. Such estimates will always be either more or less accurate approximations of actual emissions.

A strength of the PCAF standard is the data hierarchy (see Table 2). This allows financial institutions to demonstrate both to themselves and to other stakeholders where they have high-quality data. It also enables financial institutions to get started making calculations even with limited access to company-specific data and then work to move up in the hierarchy of data quality.

13) EU Regulation 2020/1818

Estimates are only as good as the assumptions they are based on and the data used. It has therefore been important for these guidelines to contribute to bringing the financial services industry to agreement on certain assumptions that are not defined through PCAF and to help identify high-quality data sources.

In general, it can be argued that companies have better control over their emissions, the closer these emissions are to their "own operations". As a consequence, most companies have better estimates for their Scope 1 and Scope 2 emissions than for their Scope 3 emissions. The PCAF standard follows a stepwise expansion of the sectors for which financial institutions should report financed Scope 3 emissions. To ensure high-quality reporting of financed Scope 3 emissions, the financial services industry is entirely dependent on better reporting of Scope 3 emissions from companies with outstanding amounts.

Double counting of emissions

A company's emissions are divided into three parts according to the GHG Protocol: Scope 1, Scope 2 and Scope 3 (see Figure 2). The purpose of reporting on Scope 1, Scope 2 and Scope 3 is to create transparency about greenhouse gas emissions throughout the value chain.

Scope 2 and Scope 3 emissions are, by definition, someone else's Scope 1 emissions, in other words, this is double counting. This also applies to financed emissions. For financed emissions that consider greenhouse gas emissions across a portfolio, situations may arise where double counting occurs not just once, but several times.

The guidelines recommend that financial institutions do not make corrections to avoid such double counting, but financial institutions can choose to provide a qualitative description of the challenges presented by double counting.

Example of double counting of emissions

A small ecosystem consisting of a bank, an oil company, a truck manufacturer and a transportation company with trucks. Emissions related to the combustion of diesel fuel during the truck's operation will be the transportation company's Scope 1 emissions but will also simultaneously be Scope 3 emissions for both the oil company and the truck manufacturer. If the bank has exposure to more than one of these actors, the bank will count these emissions multiple times.

Differences between the PCAF standard and these guidelines

These guidelines are based on the PCAF standard, and it has been an important goal not to deviate from it. There are no areas where these guidelines deliberately deviate from the PCAF methodology for calculating financed emissions. However, these guidelines provide some clarifications and recommendations that are not directly found in the PCAF standard:

1. Shipping is treated as a separate asset class in these guidelines, where emissions are calculated based on the emissions and value of the ships. The PCAF standard does not contain specific guidance on shipping, but the shipping asset class in these guidelines can be considered a special case of the project finance asset class in the PCAF standard.
2. Unlike the PCAF standard, these guidelines include sector-specific recommendations. The sector-specific recommendations are designed to help financial institutions report in accordance with the PCAF standard, so there are no contradictions between the sector-specific recommendations and the PCAF standard.
3. These guidelines recommend that financial institutions report their customers' Scope 2 emissions within asset classes where the emission intensity of electricity is critical for emission calculations (illustrated by mortgages and commercial real estate), using both market-based and location-based methods (see the chapter on "*Emission intensity for electricity*" chapter). The new guidelines for reporting emissions from real estate, published by PCAF in March 2023, also recommend that financial institutions report using both market-based and location-based methods for real estate exposures.[14] The PCAF standard itself only states that one of the methods must be used.
4. To calculate the attribution factor for loans to agricultural customers, these guidelines recommend attributing financed emissions based on the customer's loan-to-value (LTV) ratio because this will provide the most accurate valuation estimate for the financial institution's exposure and the agricultural customer's value. Finance Norway considers this a clarification rather than a deviation from the PCAF standard.
5. For aquaculture companies, these guidelines recommend using EVIC to represent the aquaculture company's value, just like the PCAF standard. If financial institutions do not have access to EVIC, these guidelines propose a new variable to represent the aquaculture company's value: on-balance sheet value of the company minus the on-balance sheet value of its licences plus the market value of the licences. This is because Finance Norway believes this variable will produce a figure closer to EVIC than the on-balance sheet values. If financial institutions do not have access to data to calculate this variable, these guidelines, like the PCAF standard, recommends that financial institutions use the on-balance sheet value of the company.

14) PCAF, CRREM and GRESB – Accounting and reporting of GHG emissions from real estate operations – Technical guidance for the financial industry

Emission intensity for electricity

The extent of greenhouse gas emissions resulting from electricity consumption significantly influences various emission calculations, such as when determining financed emissions from mortgages and commercial real estate. How financial institutions calculate the emission intensity of electricity consumption for financed emissions is not fully defined by the PCAF standard or the GHG Protocol.

The GHG Protocol serves as the foundational framework for emissions reporting, and the PCAF standard provides a framework for reporting in accordance with the GHG Protocol, Scope 3, subcategory 15, loans and investments.

For a typical company, emissions resulting from electricity consumption fall under the company's Scope 2 emissions. This also applies to financial institutions when reporting their own Scope 1 and Scope 2 emissions. According to the GHG Protocol's guidelines for Scope 2 reporting, organisations should report Scope 2 emissions using two different methods: the market-based method and the location-based method.[15] This is because both methods have their strengths and weaknesses.

When financial institutions calculate their Scope 3, subcategory 15, financed emissions, performing all calculations using both the market-based and location-based methods can be labour-intensive and complex. Finance Norway's interpretation is that PCAF considers the market-based method to produce higher-quality data than the location-based method. However, PCAF uses the location-based method for emission intensity in its own database for energy consumption and greenhouse gas emissions from buildings.

Finance Norway has not identified any financial institutions that have employed the market-based method in calculating their financed emissions. Additionally, the market-based method has a weakness in that using it to make decisions about energy efficiency could create a misleading impression that energy efficiency measures in Norway would result in much larger reductions in greenhouse gas emissions than they actually do. The Norwegian Water Resources and Energy Directorate (NVE) notes:

"Using the CO_2 factor in the product declaration (market-based method, editor's note) to calculate one's climate footprint will provide a false impression of high emissions associated with electricity use in Norway. This could consequently create a misleading impression that reducing electricity consumption would lead to significant reductions in climate emissions."[16]

Relying solely on the location-based method would undermine the system of Guarantees of Origin. The Guarantees of Origin certification scheme for electricity indicates to customers that a specific amount of electricity was generated from a particular energy source in a given year. This system was introduced with the EU's first Renewable Energy Directive in 2001 to give consumers a choice between renewable and non-renewable energy sources.[17] These guarantees result in increased revenue for renewable energy producers and can incentivise greater investment in renewable energy production, all else being equal.

Financial institutions are required to report their customers' Scope 2 emissions within asset classes where the emission intensity of electricity is crucial for emission calculations. This applies to both the market-based and location-based methods. The identified asset classes where the emission intensity of electricity is critical for greenhouse gas emission calculations are commercial real estate and mortgages. This aligns with the new guidance from PCAF, CRREM (Carbon Risk Real Estate Monitor) and GRESB (formerly Global Real Estate Sustainability Benchmark) issued in March 2023.[18] Reporting should clearly indicate when market-based and location-based methods are used.

When consolidating financed emissions, it is preferrable to use the location-based calculations. Finance Norway notes that, internationally, there is a prevalence of financial institutions using the location-based method, and the adoption of this method by Norwegian entities will make the data as comparable as possible to international figures.

For the market-based method, these guidelines recommend using Guarantees of Origin, Power Purchase Agreements (PPAs) or other documentation specifying the source from which electricity was purchased. For exposures where financial institutions do not have such contractual information, these guidelines recommend using NVE's calculated electricity disclosure for power suppliers.[19]

15) This applies only to enterprises operating in areas where market-based emission intensity for electricity exists, including the EEA.
16) NVE's calculated electricity disclosure for power suppliers
17) Directive 2001/77/EC
18) PCAF, CRREM and GRESB – Accounting and reporting of GHG emissions from real estate operations – Technical guidance for the financial industry
19) NVE's calculated electricity disclosure for power suppliers (translated to English by Finance Norway)

When choosing location-based emission intensity for electricity, Finance Norway's interpretation of the PCAF standard and the GHG Protocol is that the more localised, the better. In other words, a Norwegian location-based emission intensity is better than a Nordic one, which in turn is better than a European one. PCAF's own database for building energy consumption and emissions uses national location-based emission intensity.

GHG Protocol Scope 2 Guidance states that all net physical imports/exports should be considered when calculating location-based emission intensity, and emission intensities that account for import/export are of higher data quality than those that do not.

The calculation of financed emissions should represent the emissions that occurred in the year for which the calculations are made, and it is therefore not natural to consider life cycle emissions from electricity production. If a company builds or decommissions a power plant in a given year, these emissions will be attributed to that company for that year, and if the company is financed by a financial institution, the emissions will be attributed to financed emissions for that year. If financial institutions use emission intensities for electricity that account for emissions from the construction or decommissioning of the power plant (life cycle emissions), these emissions will be double-counted.

There are various location-based emission intensities for electricity used in the Norwegian market today. Some do not account for import/export, some represent life cycle emissions associated with electricity production (such as including emissions from the construction of power plants, restoration after the end of their lifespan etc.), and some aggregate a larger geographical area than Norway, such as the Nordic region.

When choosing location-based emission intensity, emphasis is placed on the selected emission intensity being Norwegian, accounting for import/export and representing emissions that occurred in the year in question. Based on these criteria, these guidelines recommend using NVE's climate disclosure for physically delivered electricity.[20]

It is expected that NVE will annually update its climate disclosure for physically delivered electricity for the previous year around May/June, and these guidelines recommend that financial institutions update the factors for location-based emission intensity as soon as possible after NVE's update.

20) NVE's climate disclosure for physically delivered electricity

ASSET CLASSES

1. Listed equity and corporate bonds

Definition of the asset class

This asset class covers all listed equity and corporate bonds traded in the market, where the capital is not tied to specific purposes, i.e. *unknown use of proceeds*.

This method can also be used for indirect investments, such as investments in mutual funds that invest in listed equity and corporate bonds. Corporate bonds where capital is tied to specific purposes are not covered by this asset class. This applies, for example, to green bonds. Derivatives, sovereign debt and assets held for short periods for sale, such as the trading portfolio, are similarly not covered by this asset class.

Emissions covered by this asset class

Financial institutions must report on the absolute Scope 1 and Scope 2 emissions for outstanding amounts in all sectors. These guidelines recommend that financial institutions follow the gradual phase-in of Scope 3 emissions according to the PCAF standard.[21] This includes, among other things, that financial institutions should report Scope 3 emissions from oil and gas and mining starting in 2021. If financial institutions report on Scope 3 emissions from their exposures, this should be done separately from the Scope 1 and Scope 2 emissions. If financial institutions do not report on Scope 3 emissions from their exposures in accordance with the gradual phase-in of the PCAF standard, they should explain why.

Both the PCAF standard and these guidelines acknowledge that the comparability, coverage, transparency and reliability of data on Scope 3 emissions vary significantly between different industries.

Coverage

These guidelines recommend 100 per cent coverage of listed equity and corporate bonds. If this is not possible, financial institutions should be transparent about the reasons for the less-than-full coverage, which part of the portfolio is not included, and what is required for this part to be included at a later date.

Attribution of emissions

Financed emissions from listed equity and corporate bonds should represent the amounts of the exposures' annual greenhouse gas emissions that the financial institution has financed.

The attribution factor consists of the outstanding amount to the company in the numerator and the company's value in the denominator

For publicly listed equity, the outstanding amount should be set to the market value of the exposure, which is the number of shares multiplied by the market value per share. For corporate bonds, the outstanding amount should be set to the book values of the amount.

For publicly traded companies, the company's value should be set to the Enterprise Value Including Cash (EVIC). For corporate bonds from unlisted companies, the company's value should be set to the sum of the on-balance sheet value of the company's equity and debt, since the market value of the company's equity is not available. For a detailed definition of these terms, refer to the PCAF standard.[22]

Attribution factor for listed companies:

$$\text{Attribution factor}_c = \frac{\text{Outstanding amount}_c}{\text{EVIC}_c}$$

Where *c* is for company c.

Attribution factor for corporate bonds and unlisted companies:

$$\text{Attribution factor}_c = \frac{\text{Outstanding amount}_c}{\text{Total equity}_c + \text{Debt}_c}$$

Where *c* is for company c.

Data and data quality

For all asset classes, there are three different methods for calculating financed:

Method 1 – Reported emissions
Method 2 – Calculated emissions based on physical activity
Method 3 – Calculated emissions based on economic activity

See table 2, "*Generic data hierarchy*", for more information.

21) PCAF – Financed Emissions – The Global GHG Accounting and Reporting Standard part A, table 5-2, p. 51

22) PCAF – Financed Emissions – The Global GHG Accounting and Reporting Standard part A

Financial institutions should use data of the highest possible data quality to calculate their financed emissions. Over time, these institutions should aim to move up in the hierarchy of data quality.

Data regarding emissions under methods 1, 2 and 3 can be collected from the exposures, third-party data providers or estimated by the financial institutions themselves. If financial institutions use third-party data providers, they should demand transparency, publication of the calculation method used, assurance that the calculation method is in accordance with the GHG Protocol, and that they provide data quality scores in accordance with PCAF.

When using methods 2 and 3, these guidelines recommend that financial institutions rely on robust and reputable sources for estimating financed emissions.

Equations to calculate financed emissions

The general equation for financed emissions for listed equity and corporate bonds is:

$$\text{Financed emissions} = \sum_{c} \text{Attribution factor}_{c} \times \text{Company's emissions}_{c}$$

Where *c* is for company c.

For listed companies:

$$\text{Financed emissions} = \sum_{c} \frac{\text{Outstanding amount}_{c}}{\text{EVIC}_{c}} \times \text{Company's emissions}_{c}$$

Where *c* is for company c.

For corporate bonds and unlisted companies:

$$\text{Financed emissions} = \sum_{c} \frac{\text{Outstanding amount}_{c}}{\text{Total equity}_{c} + \text{Debt}_{c}} \times \text{Company's emissions}_{c}$$

Where *c* is for company c.

Next steps

PCAF discusses in its latest version of the standard how financial institutions should report on emission removals, also known as negative emissions or sequestration, and avoided emissions. These guidelines does not delve into this, as the updated version of the PCAF standard was introduced late in the development of the guidelines. However, if financial institutions report on emission removals or avoided emissions, it is important to report these separately from other financed emissions.

2. Business loans and unlisted equity

Definition of the asset class

This asset class includes all on-balance sheet investments, loans and lines of credit to businesses, nonprofits or any other organisation that are not traded on a market and are for general corporate use, i.e. involving the *unknown use of proceeds* as defined by the GHG Protocol. For financing products such as *revolving credit facilities, bridge loans and letters of credit*, only those loans outstanding on the financial institution's year-end balance sheet are covered by this asset class.

This asset class should not be used for business loans for specific corporate purposes (*i.e. with known use of proceeds*), as such loans are covered by the project finance asset class. This applies even if the entity to which the money is lent is not organised as a project. In cases where a project is organised as a private limited company, the calculation will in practice be the same whether one uses the business loans and unlisted equity asset class or the project finance asset class.

Emissions covered by this asset class

Financial institutions must report on the absolute Scope 1 and Scope 2 emissions for exposures in all sectors. It is recommended that financial institutions follow the gradual phase-in of Scope 3 emissions according to the PCAF standard.[23] This includes, among other things, that financial institutions should report Scope 3 emissions from oil and gas, as well as mining, from 2021. If financial institutions report on Scope 3 emissions for their exposures, this should be done separately from the Scope 1 and Scope 2 emissions. If financial institutions do not report on Scope 3 emissions for their exposures in line with the gradual phase-in according to the PCAF standard, they should explain why.

Both the PCAF standard and these guidelines acknowledge that the comparability, coverage, transparency and reliability of data on Scope 3 emissions vary significantly between different industries.

Coverage

These guidelines recommend 100 per cent coverage of listed equity and corporate bonds. If the coverage is less than 100 per cent, financial institutions should be transparent about the reasons for the less-than-full coverage, which part of the portfolio is not included, and what is required for this part to be included at a later date.

23) PCAF- Financed Emissions – The Global GHG Accounting and Reporting Standard part A, table 5-2, p. 51

Attribution of emissions

Financed emissions from business loans and unlisted equity should represent the outstanding amounts' share of annual greenhouse gas emissions that the financial institution has financed. The attribution factor consists of the outstanding amount in the numerator and the company's value in the denominator.

For business loans, the outstanding amount should be set to the debt the borrower has to the lender. For investments in unlisted equity, the outstanding amount should be set to the value of the equity the financial institution holds in the company.

For business loans and investments in unlisted companies, the value of the company should be set to the sum of the on-balance sheet value of the company's equity and liabilities.

For business loans to listed companies, the company's value should be set to Enterprise Value Including Cash (EVIC). Please refer to the PCAF standard for a detailed definition of these terms.[24] If a financial institution uses on-balance sheet values instead of EVIC as a measure of the company's value, it should provide the rationale for this and describe the impact on the calculations in the reporting.

Attribution factor for business loans and equity investments in unlisted companies:

$$\text{Attribution factor}_c = \frac{\text{Outstanding amount}_c}{\text{Total equity}_c + \text{debt}_c}$$

Where *c* is for company c.

For equity investments, the outstanding amount is calculated as follows:

$$\text{Outstanding amount}_c = \frac{\#\text{ shares owned by the financial institution}_c}{\#\text{ total shares in the company}_c} \text{ x total equity}_c$$

Where *c* is for company c.

Attribution factor for business loans to listed companies:

$$\text{Attribution factor}_c = \frac{\text{Outstanding amount}_c}{\text{EVIC}_c}$$

Where *c* is for company c.

24) PCAF – Financed Emissions – The Global GHG Accounting and Reporting Standard, part A

Data and data quality

For all asset classes, there are three different methods for calculating emissions:

Method 1 – Reported emissions
Method 2 – Calculated emissions based on physical activity
Method 3 – Calculated emissions based on economic activity

See Table 2, "*Generic data hierarchy*", for more information.

Financial institutions should use the highest quality data possible to calculate their financed emissions. Over time, these institutions should aim to move up in the hierarchy of data quality.

Data on emissions under methods 1, 2 and 3 can be collected from exposures, third-party data providers or estimated by the financial institutions themselves. If financial institutions use third-party data providers, they should demand transparency, publication of the calculation method used, assurance that the calculation method is in accordance with the GHG Protocol, and that the data provider provides data quality scores in accordance with PCAF.

When using methods 2 and 3, these guidelines recommend that financial institutions rely on robust and reputable sources for estimating financed emissions.

Equations to calculate financed emissions

The general equation for financed emissions for corporate loans and unlisted equity is:

$$\text{Financed emissions} = \sum_{c} \text{Attribution factor}_{c} \times \text{Company's emissions}_{c}$$

Where *c* is for company c.

For business loans and equity investments in unlisted companies:

$$\text{Financed emissions} = \sum_{c} \frac{\text{Outstanding amount}_{c}}{\text{Total equity}_{c} + \text{Debt}_{c}} \times \text{Company's emissions}_{c}$$

Where *c* is for company c.

For business loans to listed companies:

$$\text{Financed emissions} = \sum_{c} \frac{\text{Outstanding amount}_{c}}{\text{EVIC}_{c}} \times \text{Company's emissions}_{c}$$

Where *c* is for company c.

Next steps

PCAF has indicated that guidance for investments in buyout funds will be provided in later versions of the standard.

PCAF discusses in its latest version of the standard how financial institutions should report on emission removals, also known as negative emissions or sequestration, and avoided emissions. These guidelines do not delve into this, as the updated version of the PCAF standard was introduced late in the development of the guidelines. However, if financial institutions report on emission removals or avoided emissions, it is important to report these separately from other financed emissions.

3. Project finance

Definition of the asset class

This asset class includes all on-balance sheet loans or investments in projects or activities that are designated for specific purposes, i.e. with *known use of proceeds* as defined by the GHG Protocol. This could be the construction of a hydropower plant, wind farm, solar park, specific energy efficiency measures and more. When financial institutions calculate financed emissions for this asset class, only the financed activities should be included. Emissions and financials related to existing activities outside the financed project but within the financed organisation are not included.

To avoid double counting, emissions from such projects should not be included in the calculations of financed emissions from the parent company under the listed equities and corporate bonds or business loans and unlisted equity asset classes. However, this is very challenging in practice.

Emissions covered by this asset class

Financial institutions should report on the project's absolute Scope 1 and Scope 2 emissions. It is recommended that financial institutions follow the gradual phase-in of Scope 3 emissions according to the PCAF standard.[25] If financial institutions report on Scope 3 emissions, this should be disclosed separately from Scope 1 and Scope 2 emissions.

Coverage

These guidelines recommend coverage of 100 per cent for financing where capital is earmarked for specific purposes. If the coverage is less than 100 pr cent, financial institutions should be transparent about the reasons for the less-than-full coverage, which part of the portfolio is not included, and what is required for this part to be included at a later date.

Attribution of emissions

Financed emissions from project financing should represent the share of the project's annual emissions that the financial institution has financed. The attribution factor consists of the outstanding amount to the project in the numerator and the project's value in the denominator.

For debt financing, only the original loan amount minus any repayments should be included in the outstanding amount to the project. Accrued interest should not be included.

For equity investments, the outstanding amount to the project is calculated by taking the financial institution's relative share of the total number of shares multiplied by the total equity on the project's balance sheet.

Emissions are not attributed to guarantees until they are converted into equity investments or loans.

The project's value is represented by the sum of equity and liabilities from the balance sheet.

Attribution factor for project finance:

$$\text{Attribution factor}_p = \frac{\text{Outstanding amount}_p}{\text{Total equity}_p + \text{Debt}_p}$$

Where *p* is for project p.

For equity investments, outstanding amounts are calculated as follows:

$$\text{Outstanding amount}_p = \frac{\#\text{ shares owned by the financial institution}_p}{\#\text{ total shares in the company}_p} \text{ x equity}_p$$

Where *p* is for project p.

It is expected that the distribution between equity and debt on the project's balance sheet will change over time, with the proportion of equity increasing as debt is repaid.

Data and data quality

For all asset classes, there are three different methods for calculating emissions:

Method 1 – Reported emissions
Method 2 – Calculated emissions based on physical activity
Method 3 – Calculated emissions based on economic activity

See Table 2, "*Generic data hierarchy*", for more information.

Financial institutions should use the highest quality data possible to calculate their financed emissions. Over time, these institutions should aim to move up in the hierarchy of data quality.

25) PCAF- Financed Emissions – The Global GHG Accounting and Reporting Standard part A, table 5-2, p. 51

Data on emissions under methods 1, 2 and 3 can be collected from exposures, third-party data providers or estimated by the financial institutions themselves. If financial institutions use third-party data providers, they should demand transparency, publication of the calculation method used, assurance that the calculation method is in accordance with the GHG Protocol, and that the data provider provides data quality scores in accordance with PCAF

When using methods 2 and 3, these guidelines recommend that financial institutions rely on robust and reputable sources for estimating financed emissions.

Equations to calculate financed emissions

The general equation for financed emissions for project finance is:

$$\text{Financed emissions} = \sum_{p} \text{Attribution factor}_{p} \times \text{Company's emissions}_{p}$$

Where *p* is for project p.

Together, this makes:

$$\text{Financed emissions} = \sum_{p} \frac{\text{Outstanding amount}_{p}}{\text{Total equity}_{p} + \text{Debt}_{p}} \times \text{Project's emissions}_{p}$$

Where *p* is for project p.

Next steps

PCAF discusses in its latest version of the standard how financial institutions should report on emission removals, also known as negative emissions or sequestration, and avoided emissions. These guidelines do not delve into this, as the updated version of the PCAF standard was introduced late in the development of the guidelines. However, if financial institutions report on emission removals or avoided emissions, it is important to report these separately from other financed emissions.

4. Commercial real estate

Definition of the asset class

The recommendations for the commercial real estate asset class apply to the financing of commercial real estate used for income-generating purposes, such as leasing office space, hotels, warehouses or large multifamily rentals. The PCAF standard includes large multifamily rentals in the commercial real estate asset class, even though many financial institutions do not classify them as commercial real estate in their segment reporting. These guidelines choose to follow the PCAF standard and recommend that large multifamily rentals be included in the calculation of emissions in the commercial real estate category.

According to the PCAF standard, the financial institution's on-balance sheet properties where the financial institution does not have operational control over the property are also included. These recommendations can be used by both equity and debt investors.

The recommendations in these guidelines apply regardless of whether the borrower owns the property directly or through a company. Similarly, the guidelines cover properties where the lender does not have collateral in the property, but the property is secured with share pledges or waiver of owner's rights. The crucial point is to cover the financed emissions of the properties.

Investments or loans where the property is pledged for purposes other than commercial leasing of commercial real estate and large multifamily rentals are not covered by this asset class. An example of "other purposes" is when the borrower's primary business activity is industrial and the property is pledged for loans to the industrial company. These should use the listed equity and corporate bonds or business loans and unlisted equity asset class, depending on how the activity is classified.

There are different ways to identify relevant borrowers and properties in the commercial real estate asset class:

1. Financed properties belonging to all borrowers with the NACE code (industry code) L – Real estate activities.
2. Financed properties belonging to all borrowers within the financial institution's own defined segments related to commercial real estate and large multifamily rentals.

NACE codes (option 1) may be incorrect in the Brønnøysund Register Centre and may therefore lead to incorrect segment classification (see also the chapter entitled "*Sources of errors and weaknesses*"). The financial institution's own definition of commercial real estate/large multifamily rentals (option 2) will often provide a more precise specification of the sample.

Emissions covered by this asset class

All operational emissions from the property's Scope 1 and Scope 2 emissions are included. This includes, among other things, energy consumption for both technical facilities and tenant premises. The property's Scope 1 emissions include direct emissions from a property's combustion of fossil fuels and biomass, such as for heating and hot water production. In addition, Scope 1 emissions may be related to transportation associated with operating the buildings. Leakages of refrigerants (F-gases) from refrigeration machines and heat pumps are also considered Scope 1 emissions and can be a significant source of the property's total emissions. Often, information related to Scope 1 emissions is not available, even though emissions of F-gases, in particular, can be a significant source of emissions in certain types of buildings (see the section *"Next steps"* at the end of this chapter).

The property's Scope 2 emissions include indirect emissions from the purchase of energy such as electricity, district cooling, district heating etc. Note that tenant's directly purchased electricity consumption in accordance with the GHG protocol can be declared as either Scope 2 or Scope 3 emissions for the building or property owner.[26] These guidelines recommend including this in the property owner's Scope 2 emissions, in accordance with the "*whole-building approach*" from *"Accounting and Reporting of GHG Emissions from Real Estate Operations – Technical Guidance for the Financial Industry"*.[27] It all falls under the financial institution's Scope 3 emissions, subcategory 15, investments and loans.

In some cases, financial institutions will have investments in, or loans to, the building's tenants in addition to the owner of the building. In such cases, double counting of Scope 2 emissions may occur since they are included both in the financial institutions' exposure to tenants (through the asset classes listed equity and corporate bonds or business loans and unlisted equity) and in the exposure to the building owner (through the commercial real estate asset class). Financial institutions should not make adjustments to avoid such double counting.

Reporting on financed emissions from the construction or renovation of buildings is voluntary. If the developer reports on emissions from the construction phase, these guidelines recommend that financial institutions take this into account in their reporting. In line with the GHG protocol, a process has begun to define how greenhouse gas emissions from construction and renovation should be reported. If the developer does not report on emissions from the construction phase, financial institutions are encouraged to motivate the developer to do so. In the Norwegian guidance notes for the Norwegian Regulations on Technical Requirements for Building Works, there is a requirement for the preparation of GHG accounts for the construction of blocks of flats and commercial buildings (one-year transition period), starting from 1 July 2022.[28]

Emissions from the construction phase, including *embodied emissions*, can constitute a significant share of the emissions from the life cycle of a building and are an area expected to receive more attention in the future. PCAF states that when robust methods and data for this are in place, it will be possible for PCAF to include this in its recommendations.

Coverage

Ideally, all exposures that align with the definition of the asset class should be covered in the calculations of financed emissions, even if data and information are incomplete. There will likely be varying data quality for different parts of the portfolio. The section on "*data and data quality*" provides recommendations on how to highlight this.

Attribution of emissions

The financial institution's share of emissions is set as the financial institution's outstanding amounts to the properties divided by the properties' value. Regardless of whether it is a loan to or an investment in property, the outstanding amount is defined as drawn loans or investments on the balance sheet at the end of the financial year, which means that unused credit facilities are not included. Guarantees or interest rate hedging transactions are therefore not included either.

The attribution factor is thus given by:

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

Where p is for property p.

26) Greenhouse Gas Protocol
27) PCAF, CRREM and GRESB – Accounting and reporting of GHG emissions from real estate operations – Technical guidance for the financial industry
28) Norwegian Regulations on Technical Requirements for Building Works (TEK 17) with guidance, Section 17-1 – GHG accounts for materials (Norwegian only)

The PCAF standard recommends using the property's value at origination (financing date, value at origination) in the denominator for the attribution of emissions and updating it upon loan renewal or other modifications. For some financial institutions, it can be challenging to obtain the value at the origination unless it is shortly after the financing date.

The PCAF standard recommends using the property's value at origination (financing date, value at origination) in the denominator for the attribution of emissions and updating it upon loan renewal or other modifications. For some financial institutions, it can be challenging to obtain the value at the origination unless it is shortly after the financing date.

Norwegian financial institutions have good access to up-to-date property value estimates due to regulatory requirements under the Capital Requirements Regulation, which require that credit institutions perform annual updates of market values for their loans to commercial real estate.[29] Starting in 2022, there is a requirement to obtain independent property appraisals at the time of loan origination, which is expected to provide more data on value at origination in the future.[30,31]

Loans for commercial real estate have relatively short maturities and are frequently refinanced. This means that the difference between the most recent available value and the value at origination is usually not significant. It is recommended to use the value at origination when available. The PCAF standard recommends that if financial institutions do not have the value at origination, they can use the current value but lock it for future reporting. Financial institutions should be transparent about the proportion of their portfolio calculated using the value at origination and the proportion calculated using the most recent available value (if different from the value at origination). They should also disclose whether they have locked the current value for future reporting.

In more complex collateral structures where one loan has multiple collateral properties, multiple loans have one collateral property, or multiple loans have multiple collateral properties (cross-collateralisation), emissions should be attributed according to the main rule of financial institutions' exposure to the properties divided by the properties' value but capped at 100 per cent. In the case of one loan and multiple collateral properties, the emissions for different collaterals should be weighted by the value of the collateral. See the example box "*Example of cross-collateralisation: one loan, multiple collateral properties*" further down. Access to data for calculating the attribution factor in these structures may vary between different banks. The important thing is to avoid double-counting emissions for a property and to calculate financed emissions for all properties. Banks should also remember to include properties where only equities or a declaration of non-disposal for the property have been taken as collateral.

29) Capital Requirements Regulation – EU 575/2013 (CRR) Art. 208
30) The Financial Supervisory Authority of Norway – Circular on valuation requirements for loan origination and monitoring
31) European Banking Authority – Final report – Guidelines on loan origination and monitoring, paragraph 209

Data and data quality

Calculation of energy consumption

Data for actual energy consumption in buildings must include tenants' consumption. While this provides the best basis, the financial services industry in general, and banks in particular, lack good data on this. Norway has extensive coverage of automatic electricity meters and a centralised data platform called Elhub,[32] which aggregates this data. This suggests a possible solution where financial institutions could access actual consumption data through Elhub. However, there are currently some regulatory challenges in relation to Elhub preventing such a solution. If actual energy consumption is available, it must not be temperature-corrected.

In the absence of consumption data, the building's energy performance certificate is an alternative source for calculating energy consumption. However, a significant percentage of Norwegian commercial buildings lack an energy performance certificate, despite a legal requirement that all commercial buildings larger than 1,000 square metres must have one.[33] As of March 2022,[34] Norges Bank (The Central Bank of Norway) has used proprietary software to identify energy performance certificates for only 22 per cent of Norwegian commercial buildings. The low coverage of energy performance certificates means that financial institutions must rely on other estimates for building energy performance. The use of such estimates makes it challenging to directly capture reductions in energy consumption and the associated effects of measures in the financed portfolio.

The PCAF standard has described various sources of data and their associated quality scores. Below are comments and considerations that may be relevant in this context.

If financial institutions have information containing different floor area definitions for a building, it is recommended to choose the floor area definition that best represents the heated floor area.

When calculating energy consumption, the goal is to estimate delivered energy. Delivered energy will, in most cases, correspond to the energy purchased and reflected on the invoice. If financial institutions use the year of construction in combination with the energy requirements according to the Norwegian Regulations on Technical Requirements for Building Works for the relevant year of construction to estimate energy consumption, they will estimate net energy demand. The difference between delivered energy and net energy demand is

32) Elhub is a technology company wholly owned by Statnett that operates a data platform containing data from measurement points throughout Norway.
33) Section 8 of the Norwegian Energy Labelling Regulations for Buildings (Norwegian only)
34) Norges Bank – Financial Stability Report 2022

mainly that delivered energy takes the efficiency of the heating system into account. These two quantities are not directly comparable, but the PCAF standard's data hierarchy makes it difficult to avoid using these two quantities interchangeably. In discussions with experts, it has been suggested that for most buildings, the difference between delivered energy and net energy demand will be less than 5 per cent. Therefore, it is considered possible to use these quantities interchangeably, as other variables, such as the relationship between estimated energy consumption in the energy performance certificate and actual energy consumption, are expected to have larger deviations.

Distribution of energy carriers in buildings (electricity, district heating, district cooling, biofuels, oil and gas)

For a portfolio of buildings where the financial institution does not have insight into the specific energy mix of the buildings, estimates for the energy mix for Norwegian commercial buildings must be used. This information can be found in Statistics Norway (SSB) table 11561.[35] Here, under detailed items, subcategory 12.3.3, *"Commerce and public services"*, specifies the distribution of energy carriers in Norwegian commercial buildings per year. Both the Norwegian Water Resources and Energy Directorate (NVE) [36] and SINTEF [37] use subcategory 12.3.3 from SSB table 11562 as an estimate for energy carriers to commercial buildings. Table 11561 shows the corresponding energy carriers converted to GWh. Please note that oil and oil products are excluded, as they are assumed to be associated with the Norwegian Armed Forces, and an additional 0.9 TWh should be deducted for data centres.[38] Also, note that detailed items per energy carrier can be found in the table.

Emission factors for energy carriers

Emission factors for electricity

The amount of greenhouse gas emissions generated from electricity consumption is a crucial factor that significantly influences various emissions calculations, such as those for mortgages and commercial real estate. How financial institutions calculate emission factors for electricity for financed emissions is not entirely defined by the PCAF standard or the GHG protocol.

In line with the chapter on "*Emission intensity for electricity*", these guidelines recommend that financial institutions report their customers' Scope 2 emissions within commercial real estate using both market-based and location-based methods. This aligns with the new guidelines issued by PCAF, CRREM and GRESB in March 2023.[39] Reporting should make it clear what is market-based and what is location-based. Separate data quality scores should be calculated for each method.

When consolidating financed emissions, it is preferrable to use the location-based calculations. Finance Norway notes that, internationally, there is a prevalence of financial institutions using the location-based method, and the adoption of this method by Norwegian entities will make the data as comparable as possible to international figures.

For the market-based method, these guidelines recommend using Guarantees of Origin, Power Purchase Agreements (PPAs) or other documentation specifying the source from which electricity was purchased. For exposures where financial institutions lack such contractual information, these guidelines recommend using the Norwegian Water Resources and Energy Directorate's (NVE) calculated electricity disclosure for power suppliers.[40] It is important to note that most financial institutions in Norway do not possess data on customers' electricity agreements, which means they do not have access to any Guarantees of Origin or PPAs. Consequently, a market-based method will largely rely on calculated energy consumption multiplied by NVE's calculated electricity disclosure for power suppliers. It is also important to note that the difference between the location-based and market-based methods in Norway will be more significant than in most other countries due to the very low emission intensity of electricity production in Norway.

When selecting location-based emission intensity, these guidelines recommend using NVE's climate disclosure for physically delivered electricity.[41]

District heating

For district heating and cooling, fjernkontrollen.no by Norsk Fjernvarme (the Norwegian District Heating Association) is a valuable source for information on the energy balance of various district heating providers.[42] Data on emission intensity per energy source used can also be found in the climate accounts for district heating (2020).[43]

If financial institutions need to calculate a national average for emission intensity from district heating, they can use Statistics Norway's (SSB) table 04730,[44] which shows the consumption of fuel used for gross production of district heating, by type of energy, along with the

35) Statistics Norway (SSB) – Table 11561 – Production and consumption of energy, energy balance and energy account
36) The Norwegian Water Resources and Energy Directorate (NVE) – Underlag for langsiktig strategi for energieffektivisering ved renovering av bygninger (Basis for long-term strategy for energy efficiency in building renovation) (Norwegian only)
37) SINTEF – Potensial- og barrierestudie. Energitjenester i næringsbygg (Study on potential and barriers for energy efficiency in commercial buildings) (Norwegian only)
38) NVE – Underlag for langsiktig strategi for energieffektivisering ved renovering av bygninger side 25, fotnote 9 (Basis for long-term strategy for energy efficiency in building renovation, page 25, footnote 9)
39) PCAF, CRREM og GRESB – Accounting and reporting of GHG emissions from real estate operations – Technical guidance for the financial industry 40) NVE's calculated electricity disclosure for power suppliers
40) NVE's calculated electricity disclosure for power suppliers
41) NVE's climate disclosure for physically delivered electricity
42) Norsk Fjernvarme – Fjernkontrollen.no
43) Norsk Fjernvarme – Climate accounts for district heating
44) SSB – Table 04730 – Consumption of fuel used for gross production of district heating, by type of energy

associated emission factors in the climate accounts for district heating. Please note that this emission factor must be adjusted (increased), as a substantial amount of energy is lost between gross production of district heating and delivery to the consumer. This adjustment factor can be calculated by dividing the sum of gross production of district heating by the sum of district heating delivered to consumers, as obtained from SSB.[45] Calculated emission factors for consumed district heating based on different energy carriers can then be determined by multiplying by this ratio.

It is expected that fjernkontrollen.no will include emission intensity [kg CO_2/kWh] for both national averages and various providers at a later stage. When this happens, the aforementioned calculation will no longer be necessary.

Emission factor for other energy carriers

For other energy carriers, one can use the Norwegian Environment Agency's overview of conversions from energy carriers to emission factors.[46]

Summary – calculation of weighted emission factors for energy consumption when the energy carrier is unknown

To calculate the greenhouse gas emissions per kWh for a commercial building or a portfolio of buildings where only estimated energy consumption data is available, the method will be as follows:

A. Calculate the average attribution of energy carriers in Norwegian commercial buildings or large multifamily rentals, see the subchapter on "*Distribution of energy carriers in buildings*" for sources and methodology.
B. Obtain or calculate emission factors per energy carrier (electricity, district heating and other relevant energy carriers).
C. Calculate a weighted emission factor based on A and B above. This factor is then multiplied by the estimated energy consumption for the specific building or portfolio of buildings.

Estimation of area in buildings where financial institutions lack access to floor area data

There are no publicly available statistics for the average size of commercial buildings in Norway. Finance Norway has identified three alternative approaches:

1. Calculate the average floor area for a commercial property by using the total floor area and the total number of buildings within various building categories from Create-Solutions or other data providers.
2. Calculate the average floor area for a commercial property by using PCAF's building database. PCAF's building database contains data on energy consumption per square metre and energy consumption per building for various building categories. Dividing energy consumption per building by energy consumption per square metre will yield the average floor area.[47]
3. Calculate the average floor area for a commercial property by using the commercial properties that financial institutions have in their own portfolios, where they have access to floor area data, and use this as a proxy for other buildings.

Finance Norway has obtained access to the total number of buildings and total floor area for various building categories from Create-Solutions. This information is provided in the table below. Please note that using PCAF's building database and using average floor area data from Create-Solutions yield significantly different estimations of average floor area.

Building category	Total floor area [m^2]	Total no. of buildings	Average size per building [m^2]
Offices	29 800 00	10 700	2 785
Retail	24 600 000	13 300	1 850
Hotels and restaurants	4 600 000	2 738	1 680
Industry	22 400 000	12 100	1 851
Warehousing	14 700 000	11 300	1 301
Other	1 900 000	448	4 241
Total	98 000 000	50 586	1 937

***Table 4** – Overview of existing commercial properties from Create-Solutions.*

45) District heating and district cooling (ssb.no)
46) The Norwegian Environment Agency – Tables for converting energy products to emissions

47) Example using of PCAF's building database to estimate the floor area of an office building: Log into the PCAF European building emission factor database in the main category *"Commercial Real Estate"* and filter results by *"Energy"*, *"Norway"*, *"Office"*, *"no EPC information"*. This calculation reveals that an average office building in Norway consumes 228.7910 MWh/year and 0.1790 MWh/m^2/year. Based on this, one can estimate an average floor area for office buildings to be 1,278 m^2 (228.7910/0.1790).

Method for calculating emissions from electricity consumption

The PCAF standard does not provide clear guidance on how financial institutions should handle data quality scores for market-based and location-based methods. Finance Norway has interpreted the PCAF standard such that alternatives 1a and 1b (see Table 5 "*Data hierarchy for commercial real estate*") for calculating financed emissions are identical, except that alternative 1a uses the market-based method and alternative 1b uses the location-based method. This means that it is not possible to achieve a data quality score of 1 using the location-based method. All other alternatives differ from each other in how energy consumption and floor area are estimated. These alternatives can therefore be used for both the market-based and location-based methods.

Data quality	Calculation method	Alt.	Variable
1	Buildings' emissions based on actual energy consumption for a full year (not temperature-corrected)	1a	Actual energy consumption of the properties is available. This is converted to greenhouse gas emissions using the market-based method. Supplier-specific emission factors are used for district heating/cooling. Note: Based on Finance Norway's interpretation of the PCAF standard, it is not possible to achieve a score of 1 using the location-based method.
2		1b	Actual energy consumption of the properties is available. This is converted into greenhouse gas emissions using average emission factors for the relevant energy sources. Supplier-specific emission factors are used for district heating/cooling.
3	Buildings' emissions based on calculated energy consumption and floor area	2a	The estimated energy consumption of the properties based on the appendix to the energy certificate (calculated energy consumption per floor area [kWh/m^2]) and heated floor area, converted to CO_2e using average emission factors for the relevant energy sources.
		2b	The estimated energy consumption of the properties based on the median energy consumption for the relevant energy performance certificate for the respective building categories[48] and heated floor area, converted to CO_2e using average emission factors for the relevant energy sources.
4		2c	The estimated energy consumption of the properties based on a robust method for estimating energy consumption, taking into account factors such as construction year,[49] data from similar properties, building category etc. and heated floor area, converted to CO_2e using average emission factors for the relevant energy sources.[50]
		3a	The estimated energy consumption of the properties based on floor area and building category, using national statistics for energy consumption by building category, converted to CO_2e using average emission factors for the relevant energy sources. An example of CRREM's "*pathways*" per country and per building category.[51,52] The alternatives are analyses conducted by Enova and NVE for Norwegian commercial buildings in 2016 and 2017. However, Finance Norway's experience is that these analyses tend to underestimate energy consumption in some building categories.PCAF's own emissions database for buildings[53] has been assessed to have lower data quality than CRREM at the current time (March 2023), but it's possible that PCAF's database will be updated to align with CRREM at a later date.
5	Buildings' emissions based on building category	3b	The estimated energy consumption of the properties based on building category and national statistics for energy consumption per building category, converted to CO_2e using average emission factors for the relevant energy sources. The difference between 3a and 3b is the lack of floor area per property. For 3b, the basis is the average size of the buildings in the sample.

***Table 5** – Data hierarchy for commercial real estate*

48) Enova – Energy rating scale. There are currently no clear guidelines for how buildings with energy performance certificate A and G are handled. Buildings with an energy performance certificate of A are estimated to be at 95 per cent of the upper threshold value for A, while buildings with an energy performance certificate of G are estimated to be at 115 per cent of the upper threshold value for F.

49) Table 5-4 combined with table 5-12 in SINTEF/Enova's *Potensial- og barrierestudie. Energitjenester i næringsbygg*(Study on potential and barriers for energy efficiency in commercial buildings) can be used to calculate energy consumption based the year of construction. Renovation of buildings can alter their energy consumption, so the construction year may not accurately represent energy consumption, but using the construction year provides a conservative approach.

50) Finance Norway is awaiting clarification from PCAF regarding whether the method has a score of 3 or 4. For now, Finance Norway has chosen a conservative approach and assigned a score of 4 to the method.

51) CREEM pathway

52) When using CRREM pathways or PCAF's European building emission factor database, these guidelines recommend that financial institutions use these to estimate energy consumption and then convert it into greenhouse gas emissions. Using these sources directly for estimating greenhouse gas emissions will result in financial institutions using a different emission factor for energy than the one recommended in these guidelines.

53) PCAF's European building emission factor database

Example of calculating energy consumption, emissions and data quality for commercial real estate

Building	Loans to the building [NOK million]	Floor area [m²]	Method	Data quality	Energy consumption [MWh/year]	Comments
A	50.0	1000	2a	3	130	Known appendix to energy certificate
B	200.0	5000	2b	3	650	Known energy performance certificate and building category
C	100.0	3000	3a	4	632.43	Known floor area and building category
D	60.0	Estimated at 2 785	3b	5	587.11	Known building category

***Table 6** – Calculation of energy consumption and data quality for commercial real estate.*

All buildings in the example are office buildings.

For building A, the financial institution has access to the appendix to the energy certificate, which states that the building has an estimated energy consumption of 130 kWh/m².

For building B, the financial institution knows that it has an energy performance certificate of C. An office building with an energy performance certificate of C has an estimated energy consumption between 115 kWh/m² and 145 kWh/m².[54] The median value for rating C is then 130 kWh/m² ((115+145)/2). For a building with an energy performance certificate of C and a known heated floor area, one could multiply the heated floor area by 130 kWh/m² to obtain the energy consumption.

For building C, the financial institution has no other information about the building except the heated floor area and building category. The financial institution has accessed CRREM's database, sheet "*2 – 1.5 kWh*", *"cell CO5"*,[55] and found that the average energy consumption for a Norwegian office building was 210.81 kWh/m² in 2022. This is then multiplied by the heated floor area to obtain energy consumption.

For building D, the financial institution only has information about the building category. The financial institution uses table 4, "*Overview of existing commercial properties*" in these guidelines to find that the average floor area for an office building is 2,785 m². The financial institution then accesses CRREM's database, sheet "*2 – 1.5 kWh*", *"cell CO5"*,[56] and finds that the average Norwegian office building had an energy consumption of 210.81 kWh/m² in 2022. This is then multiplied by the estimated heated floor area to obtain energy consumption.

$$\text{Weighted data quality score for a portfolio} = \frac{\sum_{i=}^{n} \text{Outstanding amount}_i \times \text{Data quality score}_i}{\sum_{i=}^{n} \text{Outstanding amount}_i}$$

Weighted data quality score for this example:

$$\frac{(50\,000\,000*3)+(200\,000\,000*3)+(100\,000\,000*4)+(60\,000\,000*5)}{50\,000\,000+200\,000\,000+100\,000\,000+60\,000\,000} = 3.537$$

Equations to calculate financed emissions

The attribution factor is calculated as follows:

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

Where *p* for property p.

The general equation for financed emissions for commercial real estate is:

$$\text{Financed emissions} = \sum_p \text{Attribution factor}_p \times \text{Building's emissions}_p$$

Where *p* for property p.

The buildings' emissions are calculated as the product of energy consumption from different energy carriers and the associated emission factors:

$$\text{Building's emissions}_p = \sum_e \text{Energy consumption}_{p,e} \times \text{Emission factor}_e$$

Where *e* is for energy carrier e.

Together, this makes:

$$\text{Financed emissions} = \sum_p \left(\frac{\text{Outstanding amount}_p}{\text{Property value at origination}_p} \times \left(\sum_e \text{Energy consumption}_{p,e} \times \text{Emission factor}_e \right) \right)$$

54) Enova – Energy rating scale
55) CRREM pathway
56) Ibid

Emission intensity

The PCAF standard describes a method for calculating the total greenhouse gas emissions for a given portfolio. However, the method does not say anything about calculating emission intensity. Emission intensity is defined as emissions per unit. This could be per financial unit, generally emissions per NOK million invested or lent out, or per physical unit.

For commercial real estate, emission intensity per physical unit would be CO_2 equivalents per square metre. Calculating an intensity figure enables the portfolio to be measured without changes in lending or investment volume affecting the numbers. See also Chapter 4.1 in "*PCAF Guidance on financing the European building transition to net zero*".[57]

PCAF has confirmed that the equation for calculating emission intensity is as follows:

$$\text{Financed emission intensity for a portfolio} = \frac{\sum_i^i \text{Attribution factor}_i \times \text{Building's emissions}_i}{\sum \text{floor}^i\text{area}_i \times \text{Attribution factor}_i}$$

As can be seen by the equation, the attribution factor is involved in both the numerator and the denominator. However, since the numerator and denominator are summed before calculating the fraction, this factor becomes crucial for weighting the effect of the loan-to-value ratio for both total emissions (numerator) and the size of the buildings (denominator). This means that the attribution factor in the numerator and the denominator cannot be cancelled out due to the summation symbol (sigma symbol).

In addition, each financial institution should calculate energy intensity [kWh/m^2] and monitor this key figure independently. Emission intensity is naturally affected by emission factors and external factors, while energy intensity reflects the changes in underlying energy efficiency within the portfolio in question.

Variations in weather from year to year can have a significant impact on the energy intensity in a portfolio. When financial institutions report on financed emissions, they should not be normalised for hypothetically "normal weather".[58] However, it could be useful to normalise energy intensity to assess how the portfolio's energy efficiency has evolved independently of variable weather conditions. If financial institutions adjust for changing weather conditions when calculating energy intensity, they should be open and transparent about having done so, how it was done and the sources used.

To define an emission intensity pathway towards 2050 as a basis for setting targets for a portfolio or individual buildings, financial institutions can use tools like CRREM (Carbon Risk Real Estate Monitor).[59]

For more detailed information on calculating financed emissions from buildings, refer to PCAF, CRREM and GRESB's *"Accounting and Reporting of GHG Emissions from Real Estate Operations – Technical Guidance for the Financial Industry"*.[60]

Cross-collateralisation

In commercial real estate, as in some other asset classes like mortgages and shipping, cross-collateralisation is common. For cross-collateralisation, the emissions from different collateral should be weighted according to the financial institution's exposure to these collaterals. No distinction is made based on different priorities in the collateral properties.

Example of cross-collateralisation: one loan, multiple collateral properties

A customer has a loan of NOK 100 million with collateral in three different office buildings. The characteristics of the various properties can be seen in the table below.

What	Property 1	Property 2	Property 3
Value of collateral [NOK mill]	50	75	30
Heated floor area [m^2]	1000	2000	500
Energy performance certificate	B	A	F
Calculated energy consumption per m^2 per year (median of the energy performance certificate) [kWh/m^2/year]	130 (115+145)/2	102.5 (90+115)/2	247.5 (220+275)/2
Calculated energy consumption per year [MWh]	130	205	123.75
Emissions per year [61] [kg CO_2e]	1430	2255	1 361.25

57) PCAF – PCAF Guidance on financing the European building transition to net zero
58) PCAF, CRREM and GRESB – Accounting and reporting of GHG emissions from real estate operations – Technical guidance for the financial industry
59) Carbon Risk Real Estate Monitor
60) PCAF, CREEM and GRESB – Accounting and Reporting of GHG Emissions from Real Estate Operations – Technical Guidance for the Financial Industry
61) Assuming that 100 per cent of the energy consumption is electricity, no other emissions and NVE's CO_2 factor for electricity consumption for 2021 with 11 gCO_2e/kWh

$$\text{Weighted emissions from the buildings} = \frac{(50\,000\,000*1430)+(75\,000\,000*2255)+(30\,000\,000*1361.25)}{50\,000\,000+75\,000\,000+30\,000\,000} = 1815.88 \text{ kg } CO_2e \text{ per year}$$

The financed emissions from the loan in questing are thus:

$$\text{Weighted financed emissions from the buildings} = \frac{100\,000\,000}{155\,000\,000} * 1\,815.88 \text{ kg } CO_2e = 1\,172 \text{ kg } CO_2e$$

Table 7 – Calculation of financed emissions in the event of cross-collateralisation.

Matters of particular relevance to commercial real estate

Several factors come into play when financial institutions calculate emissions from commercial real estate. These calculations are particularly sensitive to the choice of emission factors used. In particular, fluctuations in the emission intensity of electricity will have a significant impact on the calculated emissions from the sector.

In the period leading up to 2023, real estate prices have been growing faster than inflation (as measured by the consumer price index). In a hypothetical case where one has held a static commercial real estate portfolio with entirely static actual emissions during these years, the financed emissions would decrease faster than other financed emissions, even if the actual emissions remained static. The challenge of how changes in valuation affect financed emissions applies to all asset classes and all sectors, but it becomes particularly noticeable in real estate, which has seen many years of positive price development.

Any reduction in loans for commercial real estate (a decrease in the portfolio in absolute terms) will also lead to a decrease in financed emissions. Calculating and reporting on emission and energy intensity will address this challenge, as emissions are attributed per square metre financed.

The data quality score of the portfolio can also have a significant impact on the calculations. Several members of Finance Norway have reviewed PCAF's own database of energy consumption and emissions from buildings. Their experiences indicate that the database underestimates energy consumption in Norwegian buildings. If a financial institution has a data quality score of 5 one year and improves to a score of 3 the next year, it's likely that the calculated financed emissions will increase.

62) The Norwegian Environment Agency – Miljøstatus, Norske utslipp og opptak av klimagasser, f-gasser (Environmental status, Norwegian emissions and emission removals, F-gasses)

Next steps

According to the Norwegian Environment Agency, 2 per cent of Norway's greenhouse gas emissions in 2021 came from fluorinated gases (F-gases), including SF6, hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).[62] The largest source of F-gas emissions is from HFCs leaking from refrigeration systems, heat pumps and air conditioning units. In 2021, this alone accounted for 1.4 per cent of Norway's total emissions. Globally, F-gases contribute to approximately 1.7 gigatonnes of CO_2e emissions, with the real estate sector responsible for between an eighth and a third of this.[63]

However, obtaining information on emissions from F-gases in buildings is challenging. In an updated version of these guidelines, it may be relevant to explore how financial institutions can gather data on these emissions.

63) PCAF, CREEM and GRESB – Accounting and Reporting of GHG Emissions from Real Estate Operations – Technical Guidance for the Financial Industry

5. Mortgages

Definition of the asset class

The recommendations for the mortgages asset class should be used for all loans for the purchase or refinancing of residential properties for private individuals.

For loans to agricultural customers with property as collateral, it is recommended to use the sector-specific recommendations for agriculture.

Emissions related to the construction of dwellings are not included in this category, as these emissions are the developer's Scope 1 emissions. Technically, these emissions would be considered the homeowner's Scope 3 emissions, but since no private individuals report on their Scope 3 emissions, it is not meaningful to include them.

Emissions covered by this asset class

Scope 1 and Scope 2 emissions.

These guidelines recommend that financial institutions report on total energy consumption, energy consumption per square metre and emissions per square metre, in addition to emissions from the portfolio.

Coverage

These guidelines recommend coverage of 100 per cent of the mortgage. If this is not possible, financial institutions should be transparent about the reasons for the less-than-full coverage, which part of the portfolio is not included, and what is required for this part to be included at a later date.

Attribution of emissions

The dwelling's emissions are attributed based on the financial institution's outstanding amount for the dwelling and the property value at origination.

The attribution factor is thus given by:

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

Where d is for dwelling d.

If financial institutions cannot obtain the property value at origination, they should use the most recent available property value and lock it in until the loan is paid off or refinanced. Financial institutions should be transparent about the percentage of the portfolio for which they have used the value at origination and the percentage for which they have used the most recent available value. Since a new property appraisal is done when refinancing the property, this is considered a minor issue, as mortgages are refinanced relatively frequently.

Data and data quality

To calculate financed emissions from mortgages, financial institutions must have access to the outstanding amount for the property, the property's value at origination, the property's energy consumption, the energy carrier used by the property and emission factors for the relevant energy carriers.

Calculation of energy consumption

There are several sources that can be used to calculate a dwelling's energy consumption, and they can be divided into three categories:

1. The dwelling's emissions based on actual energy consumption.
2. The dwelling's emissions based on calculated energy consumption and floor area.
3. Calculated emissions based on average values for a typical dwelling.

The dwelling's emissions based on actual energy consumption

At the top of the data hierarchy is data that shows actual energy consumption. Norway has extensive coverage of automatic electricity meters and a centralised data platform called Elhub,[64] which aggregates this data. This suggests a possible solution where financial institutions could access actual consumption data from Elhub. However, such a solution presents some challenges related to data protection. If financial institutions use the dwelling's actual energy consumption, it is advantageous if they deduct any consumption from electric vehicle chargers, as electricity consumption for electric vehicles falls under the asset class *"Motor vehicle loans"*.

The dwelling's emissions based on calculated energy consumption and floor area

If financial institutions do not have access to actual consumption data, they can estimate the property's energy consumption. This can be done, for example, by using the building's energy

64) Elhub is a technology company wholly owned by Statnett that operates a data platform containing data from measurement points throughout Norway.

certificate. The appendix to the building's energy certificate contains information about the calculated specific delivered energy under normalised conditions, expressed in kWh/m^2 per year (alternative 2a in Table 9 "*Data hierarchy for mortgages*"). If financial institutions do not have access to the appendix to the building's energy certificate, they can use the energy rating. Thresholds for current energy ratings in Norway are given in Figure 3.

Bygningskategorier	Levert energi pr m^2 oppvarmet BRA (kWh/m^2)						
	A	B	C	D	E	F	G
	Lavere enn eller lik	Lavere enn eller lik	Lavere enn eller lik	Lavere enn eller lik	Lavere enn eller lik	Lavere enn eller lik	Ingen grense
Småhus	95	120	145	175	205	250	>F
Arealkorreksjon	+800/A	+1600/A	+2500/A	+4100/A	+5800/A	+8000/A	
Leiligheter (boligblokk)	85	95	110	135	160	200	>F
Arealkorreksjon	+600/A	+1000/A	+1500/A	+2200/A	+3000/A	+4000/A	
Barnehage	85.00	115.00	145.00	180.00	220.00	275.00	> F
Kontorbygning	90.00	115.00	145.00	180.00	220.00	275.00	> F
Skolebygning	75.00	105.00	135.00	175.00	220.00	280.00	> F
Universitets- og høgskolebygning	90.00	125.00	160.00	200.00	240.00	300.00	> F
Sykehus	175.00	240.00	305.00	360.00	415.00	505.00	> F
Sykehjem	145.00	195.00	240.00	295.00	355.00	440.00	> F
Hotellbygning	140.00	190.00	240.00	290.00	340.00	415.00	> F
Idrettsbygning	125.00	165.00	205.00	275.00	345.00	440.00	> F
Forretningsbygning	115.00	160.00	210.00	255.00	300.00	375.00	> F
Kulturbygning	95.00	135.00	175.00	215.00	255.00	320.00	> F
Lett industribygning, verksted	105.00	145.00	185.00	250.00	315.00	405.00	> F

A = oppvarmet del av BRA [m^2] *Øvre grense for karakter C er basert på nivå for TEK 2010.*

***Figure 3** – Energy performance certificate scale. Source: Enova.*[65]

If financial institutions only know the energy rating and heated floor area, these guidelines recommend using the average of the lowest and highest values in the interval in question (alternative 2b in Table 9 *"Data hierarchy for mortgages"*).

$$\text{Estimated energy consumption} = \frac{\text{Lower limit for actual energy rating} + \text{upper limit for actual energy rating}}{2}$$

For example, if one has a 100 m^2 detached house with an energy performance certificate of C, this will be:

$$\text{Estimated energy consumption} = \frac{(100*120+1600)+(100*145+2500)}{2} = 15\,300 \text{ kWh/year}$$

There are currently no clear guidelines for how buildings with energy performance certificate A and G are handled when estimating energy efficiency if one does not have access to the appendix to the building's energy certificate.

65) Enova – Energy rating scale

In the preparation of these guidelines, Finance Norway has been in contact with a nationally leading expert group that, in previous work, has used 95 per cent of the upper threshold value for A-rated dwellings, while buildings with an energy performance certificate of G are estimated at 115 per cent of the upper threshold value for F. These guidelines recommend this, too.

If financial institutions do not have information on the energy rating, it can be estimated. There are data providers in the Norwegian market that offer estimated energy consumption for homes (alternative 2c in table 9 *"Data hierarchy for mortgages"*). It is also possible to estimate this internally (also alternative 2c). For instance, the energy efficiency of a dwelling is strongly correlated with the construction year and the energy efficiency of nearby dwellings (especially for flats in the same complex). Many banks have had simulations made for construction years (based on the version of the Norwegian Regulations on Technical Requirements for Building Works used) and energy consumption in connection with the issuance of green covered bonds.

When calculating energy consumption, delivered energy is the quantity one wants to estimate. Delivered energy will in most cases correspond to the energy purchased and appearing on the invoice. If financial institutions use the year of construction in combination with the energy requirements according to the Norwegian Regulations on Technical Requirements for Building Works for the relevant year of construction to estimate energy consumption, they will estimate net energy demand. The difference between delivered energy and net energy demand is mainly that delivered energy takes the efficiency of the heating system into account. These two quantities are not directly comparable, but the PCAF standard's data hierarchy makes it difficult to avoid using these two quantities interchangeably. In discussions with experts on energy consumption in buildings, it has emerged that, for most buildings, the difference between delivered energy and net energy demand will be less than 5 per cent. It is considered possible to use these quantities interchangeably since it is expected that other variables, such as the relationship between estimated energy consumption in the energy performance certificate and actual energy consumption, will have larger deviations.

There will be a time lag from when a version of the Norwegian Regulations on Technical Requirements for Building Works (TEK) comes into force until buildings are completed according to these regulations. These guidelines recommend that financial institutions take this into account if they use the construction year as an estimate and include an approximate two-year time lag (e.g. TEK 10 entered into force on 1 July 2010. In this case, financial institutions can assume that "all" dwellings completed in 2012 were built according to TEK 10).

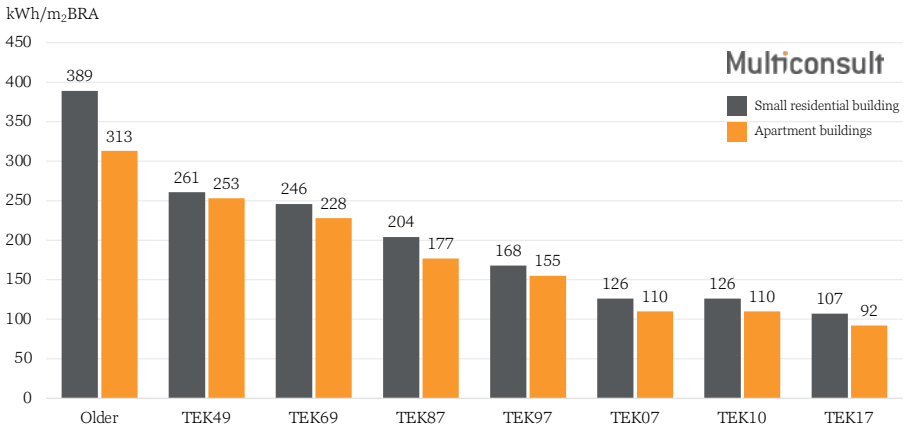


Figure 4 – Energy efficiency and construction year for Norwegian dwellings. Source: Multiconsult [66]

PCAF has, together with CRREM (Carbon Risk Real Estate Monitor), among others, created a database of energy consumption and emissions from buildings.[67] The database can be used free of charge, but financial institutions must set up an account to use it. Here, financial institutions can filter buildings based on factors such as whether they have access to an energy performance certificate, whether they have floor area data etc. Using this database may result in different data quality scores based on the information financial institutions have about the dwellings. Note that if financial institutions use this database to calculate energy consumption in blocks of flats for which they don't have floor area data, the database provides an average floor area per block of flats, not per flat. Also, please note that the PCAF database uses a different emission intensity for energy consumption in Norway than the emission intensity for electricity recommended in these guidelines. If Norwegian financial institutions use the PCAF database, these guidelines recommend using it to calculate energy consumption and then apply the factors specified in these guidelines to convert from energy consumption to emissions.

66) Multiconsult – Residential building portfolio – carbon and energy footprint, Eika Boligkreditt
67) PCAF – European building emission factor database

Emission factors for energy carriers

Emission factors for electricity

The amount of greenhouse gas emissions generated from electricity consumption is a crucial factor that significantly influences various emissions calculations, such as those for mortgages and commercial real estate. How financial institutions calculate emission factors for electricity for financed emissions is not entirely defined by the PCAF standard or the GHG protocol.

According to the chapter "*Emission intensity for electricity*", it is recommended that financial institutions report their customers' Scope 2 emissions for mortgages using both the market-based method and the location-based method. This aligns with the new guidelines released by PCAF, CRREM and GRESB in March 2023.[68] It should be clearly stated in the reporting what is market-based and which is location-based. Separate data quality scores should be calculated for each of the methods.

When consolidating financed emissions, it is preferrable to use the location-based calculations. Finance Norway notes that, internationally, there is a prevalence of financial institutions using the location-based method, and the adoption of this method by Norwegian entities will make the data as comparable as possible to international figures.

For the market-based method, these guidelines recommend using Guarantees of Origin, Power Purchase Agreements (PPAs) or other documentation specifying the source from which electricity was purchased. For exposures where financial institutions lack such contractual information, these guidelines recommend using the Norwegian Water Resources and Energy Directorate's (NVE) calculated electricity disclosure for power suppliers.[69] It is important to note that most financial institutions in Norway do not possess data on customers' electricity agreements, which means they do not have access to any Guarantees of Origin or PPAs. Consequently, a market-based method will largely rely on calculated energy consumption multiplied by NVE's calculated electricity disclosure for power suppliers. It is also important to note that the difference between the location-based and market-based methods in Norway will be more significant than in most other countries due to the very low emission intensity of electricity generation.[70]

68) PCAF, CRREM og GRESB – Accounting and reporting of GHG emissions from real estate operations – Technical guidance for the financial industry
69) NVE's calculated electricity disclosure for power suppliers
70) Ministry of Petroleum and Energy – Energifaktanorge.no

When selecting location-based emission intensity, these guidelines recommend using NVE's climate disclosure for physically delivered electricity.[71]

District heating and cooling

For district heating and cooling, fjernkontrollen.no by Norsk Fjernvarme (the Norwegian District Heating Association) is a valuable source for information on the energy balance of various district heating providers.[72] Data on emission intensity per energy source used can also be found in the *climate accounts for district heating (2020)*.[73]

If financial institutions need to calculate a national average for emission intensity from district heating, they can use Statistics Norway's (SSB) table 04730[74], which shows the consumption of fuel used for gross production of district heating, by type of energy, along with the associated emission factors in the climate accounts for district heating. Please note that this emission factor must be adjusted (increased), as a substantial amount of energy is lost between gross production of district heating and delivery to the consumer. This adjustment factor can be calculated by dividing the sum of gross production of district heating by the sum of district heating delivered to consumers, as obtained from SSB.[75] Calculated emission factors for consumed district heating based on different energy carriers can then be determined by multiplying by this ratio.

It is expected that fjernkontrollen.no will include emission intensity [kg CO_2/kWh] for both national averages and various providers at a later stage. When this happens, the aforementioned calculation will no longer be necessary.

Other energy carriers

For other energy carriers, financial institutions can use the Norwegian Environment Agency's overview of conversions from energy carriers to emission factors.[76]

Estimating the floor area of homes for which financial institutions do not have access to floor area data

When financial institutions calculate energy consumption, having accurate information about a dwelling's floor area is highly advantageous. If financial institutions have access to various floor area calculations, these guidelines recommend using the floor area measurement that best represents the heated floor area. If financial institutions do not have information about a home's floor area, they can use the average floor area for the home type in question. Both PCAF's database of energy consumption in buildings and Statistics Norway's (SSB) table 06513 contain information on average areas for various types of dwellings.[77,78] Using SSB table 06513 for the year 2022, using the entire country and setting the median size for dwellings in each floor area category, dwellings larger than 350 square metres are set to 350 square metres, and dwellings with unknown sizes are excluded. This will yield the average values provided in table 8.[79]

Type of dwelling	Average size [m²]
Detached house	171
House with two dwellings	125
Row house	104
Flat	72

***Table 8** – Average sizes for types of dwellings in Norway in 2022. SSB table 06513 and own calculations.*

Method for calculating emissions from energy consumption

The PCAF standard does not make it entirely clear how financial institutions should handle data quality scores for the market-based and location-based methods. Finance Norway has interpreted the PCAF standard to mean that alternatives 1a and 1b (see table 9 *"Data hierarchy for mortgages"*) for calculating financed emissions are identical, except that method 1a uses the market-based method and method 1b uses the location-based method. This means that it is not possible to achieve a data quality score of 1 using the location-based method. All other alternatives differ from each other in how energy consumption and floor area are estimated. These alternatives can therefore be used for both the market-based and location-based methods.

71) NVE's climate disclosure for physically delivered electricity
72) Norsk Fjernvarme – Fjernkontrollen.no
73) Norsk Fjernvarme – Climate accounts for district heating
74) SSB – Table 04730 – Consumption of fuel used for gross production of district heating, by type of energy
75) District heating and district cooling (ssb.no)
76) The Norwegian Environment Agency – Tables for converting energy products to emissions
77) PCAF – European building emission factor database
78) SSB table 06513
79) Ibid.

Data quality	Calculation method	Alt.	Variable
1	Dwelling's emissions based on actual energy consumption	1a	The dwelling's actual energy consumption is available. This is converted to greenhouse gas emissions using the market-based method. Supplier-specific emission factors are used for district heating/cooling. Note: Finance Norway's interpretation of PCAF is that it is not possible to achieve a score of 1 using the location-based method.
2		1b	The dwelling's actual energy consumption is available. This is converted to greenhouse gas emissions using average emission factors for the relevant energy sources. Supplier-specific emission factors are used for district heating/cooling.
3	Dwelling's emissions based on calculated energy consumption and floor area	2a	The calculated energy consumption of the dwelling based on the appendix to the energy certificate (calculated energy consumption per floor area [kWh/m^2]) and the heated floor area), converted to CO_2e using average emission factors for the relevant energy sources.
		2b	The estimated energy consumption of the dwellings based on the median energy consumption for the relevant energy performance certificate for the respective building categories[80] and heated floor area, converted to CO_2e using average emission factors for the relevant energy sources.
4		2c	The estimated energy consumption of the dwellings based on a robust method for estimating energy consumption, taking into account factors such as construction year, data from similar properties, building category etc. and heated floor area, converted to CO_2e using average emission factors for the relevant energy sources.[81]
	Calculated emissions based on a typical dwelling's average values	3a	The estimated energy consumption of the dwellings based on floor area and building category, using national statistics for energy consumption by building category, converted to CO_2e using average emission factors for the relevant energy sources.
5		3b	The estimated energy consumption of the dwellings based on building category and national statistics for energy consumption per building category, converted to CO_2e using average emission factors for the relevant energy sources. The difference between 3a and 3b is the lack of floor area per property. For 3b, the basis is the average size of the buildings in the sample.

***Table 9** – Data hierarchy for mortgages.*

Financial institutions should provide a weighted average for data quality in their mortgage portfolio.

Equations to calculate financed emissions

The attribution factor is calculated as follows:

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

Where *d* is for dwelling d.

The general equation for financed emissions for mortgages is:

$$\text{Financed emissions} = \sum_d \text{Attribution factor}_d \times \text{Dwelling's emissions}_d$$

Where *d* is for dwelling d.

80) Enova – Energy rating scale. There are currently no clear guidelines for how dwellings with energy performance certificate A and G are handled. These guidelines assume that dwellings with an energy performance certificate of A are estimated to be at 95 per cent of the upper threshold value for A, while dwellings with an energy performance certificate of G are estimated to be at 115 per cent of the upper threshold value for F.

81) Finance Norway has asked clarification from PCAF regarding whether the method from Eiendomsverdi has a score of 3 or 4. It seems unlikely that PCAF will give a decisive answer, and it will therefore be up to each financial institution to decide. We expect this subject to be raised in the next version of these guidelines.

The dwelling's emissions are calculated as the product of energy consumption from different energy carriers and the associated emission factors.

$$\text{Dwelling's emissions}_d = \sum_e \text{Energy consumption}_{d,e} \times \text{Emission factor}_e$$

Where *e* is for energy carrier e.

Financed emissions are thus:

$$\text{Financed emissions} = \sum_d \left(\frac{\text{Outstanding amount}_d}{\text{Property value at origination}_d} \times \left(\sum_e \text{Energy consumption}_{d,e} \times \text{Emission factor}_d \right) \right)$$

Emission intensity

The PCAF standard describes a method for calculating the total greenhouse gas emissions for a given portfolio. However, the method does not say anything about calculating emission intensity. Emission intensity is defined as emissions per unit. This could be per financial unit, generally emissions per NOK million invested or lent out, or per physical unit.

For mortgages, emission intensity per physical unit would be CO_2 equivalents per square metre. Calculating an intensity figure enables the portfolio to be measured without changes in lending or investment volume affecting the numbers. See also Chapter 4.1 in *"PCAF Guidance on financing the European building transition to net zero"*.[82]

PCAF has confirmed that the equation for calculating emission intensity is as follows:

$$\text{Financed emission intensity for a portfolio} = \frac{\sum_i^i \text{Attribution factor}_i \times \text{Dwelling's emissions}_i}{\sum_i^i \text{Floor area}_i \times \text{Attribution factor}_i}$$

As can be seen by the equation, the attribution factor is involved in both the numerator and the denominator. However, since the numerator and denominator are summed before calculating the fraction, this factor becomes crucial for weighting the effect of the loan-to-value ratio for both total emissions (numerator) and the size of the buildings (denominator). This means that the attribution factor in the numerator and the denominator cannot be cancelled out due to the summation symbol (sigma symbol).

82) PCAF – PCAF Guidance on financing the European building transition to net zero

In addition, each financial institution should calculate energy intensity [kWh/m2] and monitor this key figure independently. Emission intensity is naturally affected by emission factors and thus external factors, while energy intensity directly reflects the changes in underlying energy efficiency within the portfolio in question

Variations in weather from year to year can have a significant impact on the energy intensity in a portfolio. When financial institutions report on financed emissions, they should not be normalised for hypothetically "normal weather".[83] However, it could be useful to normalise energy intensity to assess how the portfolio's energy efficiency has evolved independently of variable weather conditions. If financial institutions adjust for changing weather conditions when calculating energy intensity, they should be open and transparent about having done so, how it was done and the sources used.

Matters of particular relevance to mortgages

The calculation of financed emissions with multiple mortgagees is done in the usual manner and does not take into account the order of priority among multiple mortgagees (such as the Norwegian Public Service Pension Fund and the Norwegian State Housing Bank).

Cross-collateralisation

For mortgages, as in commercial real estate and shipping, cross-collateralisation is common. For cross-collateralisation, the emissions are weighted according to the financial institution's exposure to these collaterals. No distinction is made based on different priorities in the collateral properties. See the example box *"Example of cross-collateralisation: one loan, multiple collateral properties"* in the chapter on commercial real estate.

83) PCAF, CRREM and GRESB – Accounting and reporting of GHG emissions from real estate operations – Technical guidance for the financial industry

6. Motor vehicle loans

Definition of the asset class

The recommendations for the motor vehicle loans asset class apply to loans to private individuals where the purpose of the loan is the purchase of a motor vehicle. The method should also be used for loans to businesses where the purpose of the loan is specified as being for the purchase of vehicles. Both of these loan categories fall under loans secured by a vendor's lien.

The motor vehicle loans asset class can also be used for vehicle leasing. Leasing is covered by the GHG Protocol, subcategory 13, downstream leased assets, and should be reported separately from the other financed emissions addressed in these guidelines, categorised in subcategory 15, investments and loans. For leasing, according to the GHG Protocol, subcategory 13, 100 per cent of emissions are assigned to the financial institution responsible for the leasing, in contrast to loans and investments, where financial institutions are assigned emissions based on their shares of the total value. The development of the method for calculating emissions for leased assets is less advanced than for financed emissions, and rapid development in this area is expected in the future.

Emissions covered by this asset class

Scope 1 and Scope 2 emissions. For Scope 1 emissions, direct emissions resulting from the combustion of fuel in vehicles ("*tank-to-wheel*") are covered. However, for electric vehicles and hybrid vehicles, the emission factor for the electricity consumption is taken from the Norwegian Water Resources and Energy Directorate's (NVE) climate disclosure for physically delivered electricity.

As of 29 January 2023, there are only 218 hydrogen-powered cars in Norway, which is less than 0.01 per cent of the total number of passenger cars. Based on the attribution of emissions mentioned above, the emissions from hydrogen vehicles are considered zero. If the number of hydrogen vehicles increases, it will be necessary to estimate emissions from hydrogen production in Norway, potentially through sources like NVE.[84]

Coverage

These guidelines recommend coverage of 100 per cent of motor vehicle loans for private individuals. This includes but is not limited to loans for cars, motorcycles, mopeds, boats and snowmobiles.

These guidelines also recommend that financial institutions report the percentage of the vehicle portfolio that is calculated using this method. It is advantageous if the vehicle portfolio is divided using a suitable classification system, such as loans to private individuals for the purchase of vehicles, loans to businesses for the purchase of vehicles, vehicle leasing for private individuals and vehicle leasing for businesses.

Financial institutions should be transparent about how they determined which types of loans and vehicles are calculated according to the methodology *"motor vehicle loans"*.

It is expected that both coverage and data quality will improve in the future, both because data from the Worldwide Harmonized Light Vehicle Test Procedure (WLTP) will be available for all vehicles and because more detailed mileage data is expected to become more accessible.

Attribution of emissions

The vehicle's emissions are attributed based on the financial institution's outstanding amount and the value at origination.

If the value of the vehicle or vehicles at origination is not known, the financial institution should take a conservative approach and assume an LTV (loan-to-value) of 100 per cent.

Data and data quality

Financed emissions from motor vehicles can largely be calculated using official statistics and data about the vehicle.

These guidelines recommend that financial institutions divide emissions from motor vehicle loans into four different categories:

- Petrol
- Diesel
- Electric
- Plug-in-hybrid

84) NVE – Hydrogen i det moderne energisystemet (Hydrogen in the modern energy system)

Non-plug-in-hybrid vehicles are considered gasoline or diesel cars based on the type of fuel the vehicle uses. If financial institutions do not have access to data regarding the distribution of kilometres travelled using electricity and fossil fuel for plug-in-hybrid vehicles, they may use national estimates from reliable sources. In 2016, the Institute of Transport Economics in Norway produced a report estimating that plug-in-hybrids in Norway covered approximately 35 per cent of their distance using electricity as the energy carrier.[85] If financial institutions do not reference sources with high reliability for estimating the distribution of kilometres travelled for plug-in-hybrids, they should assume 100 per cent use of fossil fuel.

The calculation of financed emissions from motor vehicles can be divided into three overarching categories based on the accuracy of the calculations:

- Calculations based on the vehicle's actual emissions (data quality score 1).
- Calculations based on vehicle-specific estimates (data quality score 2 and 3).
- Calculations based on non-vehicle-specific estimates (data quality score 4 and 5).

Common to these three categories is the calculation of fuel consumption, which is then multiplied by a fuel-specific emission factor.

There are numerous reliable data sources for emissions from vehicles.

The following emission factors are recommended for different types of fuels:

Fuel	Emission factor	Source	Comments
Petrol	2.3265 [kg CO_2e/litre]	The Norwegian Environment Agency [86]	-
Diesel	2.7032 [kg CO_2e/litre]	The Norwegian Environment Agency [87]	-
Electric	11 [g CO_2e/kWh]	NVE[88]	-
Hydrogen	0	-	Only looks at "tank-to-wheel"

***Table 10** – Fuel-specific emission factors.*

These emission factors do not take into account the addition of biofuel into Norwegian petrol and diesel.

For statistics on distance travelled, these guidelines recommend using Statistics Norway's (SSB) data on distance travelled for Norwegian motor vehicle loans.[89] Financial institutions should, at a minimum, distinguish between passenger cars, buses, small commercial vehicles and large commercial vehicles. If financial institutions include parameters such as the vehicle's age, drivetrain, and the owner's residence, it is possible to obtain even more accurate estimates of distance travelled. However, the decision on whether to use additional parameters is at the discretion of the financial institutions.

Estimated fuel consumption data for various types of vehicles is available in accordance with WLTP test procedures. This data can be obtained from sources such as the Motor Vehicle Register. There are also several commercial providers of this data. The vehicle-specific data includes both average fuel consumption and emissions per kilometre. Please note that if financial institutions use emissions per kilometre, it will be more challenging to account for the inclusion of biofuels in Norwegian petrol and diesel if desired in the future. If financial institutions do not have access to WLTP data, they can convert figures from the older testing standard, the *"New European Driving Cycle (NEDC)"*, to WLTP using a conversion factor.[90]

For passenger cars, vans and trucks, the Norwegian Environment Agency provides data on emissions per kilometre for various categories.[91] (Refer to the *"metode og bakgrunnsdata"* tab in the respective Excel files.)

Calculations based on the actual emissions of the vehicle (data quality score 1)

To achieve data quality score 1, financial institutions must use calculated fuel consumption from WLTP and the actual distance travelled by the vehicle, along with the relevant fuel-specific emission factor.

Calculations based on vehicle-specific estimates (data quality score 2 and 3)

To use vehicle-specific estimates, financial institutions use calculated fuel consumption from WLTP and the vehicle's estimated distance travelled, along with the relevant fuel-specific emission factor. To calculate the vehicle's estimated distance travelled, financial institutions can use SSB as the source.

85) Institute of Transport Economics – "*Learning from Norwegian Battery Electric and Plug-in Hybrid Vehicle Users, 2016*"
86) The Norwegian Environment Agency – To see the actual emission factors, right-click on any tab and select "show". Then click "hidden". For the emission factors for petrol and diesel, these guidelines have used the emission factors for passenger cars provided by the Norwegian Environment Agency. (Emission factors for diesel in certain vehicles, like tractors, are 0.85 per cent higher). Variations in emission factors for different vehicle types result from the fact that different engines lead to variations in methane and nitrous oxide emissions. These guidelines do not take this into account as these variations are not material
87) Ibid.
88) NVE – NVE's climate disclosure for physically delivered electricity
89) SSB's statistics on distances travelled
90) This report from the Netherlands, which analysed over 150,000 petrol cars and 20,000 diesel cars, found a conversion for emissions between NEDC and WLTP. For petrol cars, the conversion is y=1.08x+14.5, and for diesel cars, it's y=1.12x+15.6. If financial institutions don't have information about the drivetrain, it is recommended to use a conversion where y=1.10x+15, with the variables defined as follows: y = Greenhouse gas emissions WLTP [CO_2e/km]; x = Greenhouse gas emissions NEDC [CO_2ekm]; The constant term has units of CO_2e/km.
91) The Norwegian Environment Agency – Calculate the effect of various climate measures

Calculations based on non-vehicle-specific estimates (data quality score 4 and 5)

If financial institutions do not have access to vehicle-specific WLTP data, they can estimate the vehicle's characteristics based on the information they have available, such as the type of car, age etc. In this case, the Norwegian Environment Agency[92] and the PCAF database can be valuable sources of information. (Please note that the PCAF database is only available to financial institutions that are members of PCAF.) Financial institutions should be transparent about the assumptions they have made regarding vehicles for which no vehicle-specific efficiency or emission data are available.

Data quality	Calculation method	Alt.	Variable
1	Vehicle's actual emissions	1a	Emissions are calculated using actual fuel consumption and fuel-specific emission factors.
		1b	Emissions are calculated using actual distance travelled together with vehicle-specific estimates of fuel efficiency and fuel-specific emission factors.
2	Calculated emissions based on vehicle-specific estimates and estimated distance travelled	2a	Emissions are calculated using estimated distance travelled[93] together with vehicle-specific estimates for fuel efficiency and fuel-specific emission factors.
4	Calculated emissions based on general estimates of distance travelled and fuel efficiency	3a	Emissions are calculated using estimated distance travelled together with estimates for the vehicle based on the information financial institutions have about the vehicle (if the financial institutions know, at a minimum, the type of vehicle) for fuel efficiency and fuel-specific emission factors.
5		3b	Emissions are calculated using estimated distance travelled together with estimates for the vehicle based on the information financial institutions have about the vehicle (even if the financial institutions do not know the type of vehicle) for fuel efficiency and fuel-specific emission factors.

***Table 11** – Data hierarchy for motor vehicle loans.*

If multiple different methods are used in the calculation for the same vehicle, the quality score for the calculation should be set equal to the lowest quality (highest score). For example, if a financial institution has actual data on distance travelled (method 1b) but doesn't have vehicle-specific data available other than the type of vehicle (e.g. passenger car, method 3a), this would result in a data quality score of 4.

Financial institutions should provide a weighted average for data quality in the portfolio for motor vehicle loans.

Equations to calculate financed emissions

The attribution factor is calculated as follows:

$$\text{Attribution factor}_v = \frac{\text{Motor vehicle loan}_v}{\text{Value at origination}_v}$$

Where v is for vehicle v.

The general equation for financed emissions for motor vehicles is:

$$\text{Financed emissions} = \sum_v \text{Attribution factor}_v \text{ x Vehicle's emissions}_v$$

Where v is for vehicle v.

For vehicles, emissions can be calculated by multiplying fuel efficiency by the distance travelled, which gives the fuel consumption. When the fuel consumption is multiplied by a fuel-specific emission factor, one gets the vehicle's emissions.

$$\text{Vehicle's emissions}_v = \sum_f \text{Fuel efficiency}_{v,f} \text{ x distance travelled}_{v,f} \text{ x emission factor}_f$$

Where v is for vehicle v and f is for fuel f.

Financed emissions are thus:

$$\text{Financed emissions} = \sum_v \left(\frac{\text{Motor vehicle loan}_v}{\text{Value at origination}_v} \text{ x } \left(\sum_f \text{Fuel efficiency}_{v,f} \text{ x distance travelled}_{v,f} \text{ x emission factor}_f \right) \right)$$

92) The Norwegian Environment Agency – Greenhouse gas emissions in municipalities

93) Please note that PCAF itself differentiates between estimates for provinces/states/small countries and large countries or subcontinents. These guidelines have interpreted Norway as a small country because SSB table 12576 shows relatively little variation in distance travelled based on the county of residence.

For tractors, construction machinery and other machines where fuel consumption is not directly correlated with distance travelled, financial institutions must calculate fuel consumption using other methods. If financial institutions have actual or estimated fuel consumption data, they can use the rest of the method described above to calculate financed emissions.

Matters of particular relevance for motor vehicle loans

These guidelines provide emission factors for agriculture with and without agricultural machinery since some financial institutions classify these emissions as agricultural emissions, while some classify them as emissions from motor vehicles. Financial institutions must use the correct factors based on their own classification to avoid double-counting emissions from these machines.

Next steps

In Norway, emissions from motor vehicles (excluding aviation and commercial maritime activities) can be divided into four parts (data from 2021).[94]

- Passenger cars ~4.15 million tonnes CO_2e
- Vans, buses and trucks ~4.40 million tonnes CO_2e
- Motorcycles, mopeds, leisure boats and snowmobiles ~0.46 million tonnes CO_2e
- Tractors, construction machines and other motorised equipment ~2.53 million tonnes CO_2e

For the first two categories, there is good data on how to calculate fuel consumption, and thus emissions per kilometre travelled. For the last two categories, fuel consumption usually needs to be calculated using methods other than kilometres travelled. A natural next step to further develop these guidelines will be to explore methods for addressing this issue.

7. Shipping

Definition of the asset class

The shipping asset class pertains to on-balance sheet exposures, including loans, syndicated loans (instalment loans and revolving credit facilities, both syndicated and bilateral), investments and guarantees with collateral in vessels. The recommendations are primarily designed for the shipping sector but can be applied to all exposures to sectors that have floating assets with known values and fuel consumption, such as ferries, offshore supply, fishing vessels etc., where fuel consumption accounts for the majority of emissions.

For other forms of vessel financing, such as companies that finance themselves on an unsecured basis, financial institutions can use the listed equity and corporate bonds or business loans and unlisted equity asset classes to calculate financed emissions.

In accordance with the International Maritime Organization (IMO),[95] vessels engaged in international trade with a gross tonnage exceeding 5,000 tonnes are required to report emissions to IMO. Norway has a diversified fleet, including many vessels under 5,000 gross tonnes and many vessels involved in domestic trade. These guidelines therefore recommend that financial institutions use the shipping asset class for exposures to all vessels over 5,000 gross tonnes operating in international waters and covered by IMO's Data Collection System (DCS) reporting. It is up to the financial institutions to decide whether to include additional vessels. The specific threshold for each financial institution regarding which exposures are classified under the shipping asset class is at their discretion but should include at least ships over 5,000 gross tonnes in international trade. In reporting, financial institutions should specify where they have set the threshold and the percentage of the portfolio that is not included.

Emissions covered by this asset class

Scope 1 and Scope 2 emissions.

Coverage

Financial institutions should be transparent about the parts of their portfolio included in the shipping asset class, as well as the coverage ratio.

Attribution of emissions

The financial institutions' share of emissions is calculated by dividing their exposure to the vessel by the vessel's value at origination. Regardless of whether it's a loan to or an investment

94) SSB table 08941
95) IMO – IMO resolution MEPC.278 (70)

in shipping, financial institutions' exposure is defined as the outstanding loan or investment on the balance sheet at the end of the financial year, excluding unused facilities.

The Framework for Financed Emissions Accounting published by Finance Denmark and Insurance & Pension Denmark for calculating financed emissions includes a separate asset class for shipping,[96] similar to these guidelines. They recommend using the vessel's value at the time of contract inception (financing date, value at origination) in the denominator for emission attribution and updating this value upon loan renewal or other changes. This methodology is consistent with that used for commercial real estate and mortgages, for example. For some financial institutions, it can be challenging to obtain the value at the origination unless it is shortly after the financing date.

Fortunately, Norwegian financial institutions typically have good access to updated value estimates for vessels. This is because loans to the shipping sector have relatively short terms and are refinanced regularly. This means that the difference between the most recent available value and the value at origination is usually not significant. It is recommended to use the value at origination when available. If this is not available, the last recorded market value should be used. The PCAF standard does not include shipping as a separate asset class, but for commercial real estate, the PCAF standard recommends that if financial institutions do not have the value at origination, they can use the current value but lock it for future reporting. Financial institutions should be transparent about the proportion of their portfolio calculated using the value at origination and the proportion calculated using the most recent available value (if different from the value at origination). They should also disclose whether they have locked the current value for future reporting.

If financial institutions find themselves in a situation where the attribution factor exceeds 100 per cent, it should be set to 100 per cent.

Data and data quality

Vessels engaged in international trade with a gross tonnage exceeding 5,000 tonnes are required to report annually to the IMO DCS (*"Data Collection System"*) on their fuel consumption in metric tonnes for different fuels and the distance sailed in nautical miles.[97] This data is not made publicly available on a per-vessel basis to third parties, so it is up to financial institutions to obtain this data from shipowners, shipbrokers or data providers.

Several of Finance Norway's members have endorsed the Poseidon Principles. The data that shipowners report in line with the Poseidon Principles is a natural data source for financial institutions.

Official sources, such as the IMO or the Poseidon Principles, provide data on emission factors for different fuel types. The emission factors listed in table 12 are sourced from version 4.0 of the Poseidon Principles.[98,99]

Type of fuel	Emission factor [tonnes CO_2/tonne fuel]
Marine diesel oil/ marine gas oil (MDO/MGO)	3.206
Light fuel oil (LFO)	3.151
Heavy fuel oil (HFO)	3.114
Liquefied petroleum gas, propane (LPG)	3.000
Liquefied petroleum gas, butane (LPG)	3.030
Liquefied natural gas (LNG)	2.750
Methanol	1.375
Ethanol	1.913

***Table 12** – List of emission factors for different fuel types.*

Data quality	Calculation method	Alt.	Variable
1	Reported emissions from vessels	1a	Verified data on actual fuel consumption and factors for emissions from various fuels.
2		1b	Data on actual fuel consumption and factors for emissions from various fuels.
3	Calculated emissions from vessels based on calculated physical consumption	2a	Fuel consumption is estimated using the distance sailed. Factors for emissions from various fuels are included.
		2b	Distance sailed is estimated, and fuel consumption is estimated using the distance sailed. Factors for emissions from various fuels are included.

***Table 13** – Data hierarchy for shipping.*

96) Finance Denmark and Insurance & Pension Denmark – Framework for Financed Emissions Accounting
97) IMO – IMO resolution MEPC.278 (70)
98) Poseidon Principles – A global framework for responsible ship finance, version 4.0
99) Resolution MEPC.308(73) 2018 Guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships

Financial institutions should provide a weighted average of data quality in the shipping portfolio.

Equations to calculate financed emissions

The attribution factor is calculated as follows:

$$\text{Attribution factor}_v = \frac{\text{Financial exposure to the vessel}_v}{\text{Vessel's value at origination}_v}$$

Where v is for vessel v.

The general equation for financed emissions for shipping is:

$$\text{Financed emissions} = \sum_v \text{Attribution factor}_v \times \text{Vessel's emissions}_v$$

Where v is for vessel v.

The vessel's emissions are calculated as the product of the consumption of different fuels and the associated emission factors:

$$\text{Vessel's emissions}_v = \sum_f \text{Fuel consumption}_{v,f} \times \text{Emission factor}_f$$

Where f is for fuel f.

Together, this makes:

$$\text{Financed emissions} = \sum_v \left(\frac{\text{Financial exposure to the vessel}_v}{\text{Vessel's value at origination}_v} \times \left(\sum_f \text{Fuel consumption}_{v,f} \times \text{Emission factor}_f \right) \right)$$

Matters of particular relevance for shipping

Cross-collateralisation is handled in the same way as for commercial real estate and mortgages.

SECTOR-SPECIFIC RECOMMENDATIONS

Sector-specific recommendations

These sector-specific recommendations are intended to be used in conjunction with the relevant asset class, whether listed equity and corporate bonds, unlisted equity and business loans, or project finance. The three sectors specifically addressed in these guidelines were chosen based on their relevance to the Norwegian economy, their greenhouse gas emissions and the anticipated availability of good national data sources.

A. Aquaculture

Definition of the sector

The sector-specific recommendations for aquaculture apply to all on-balance sheet exposures related to the aquaculture sector.

Emissions scopes covered by the sector-specific recommendations

Scope 1 and Scope 2 emissions. Scope 3 emissions are optional. If reporting on Scope 3 emissions, they should be separately disclosed.

Coverage

Financial institutions must disclose the proportion of their aquaculture exposure for which they have calculated financed emissions. If financial institutions report on Scope 3 emissions, they should also disclose the proportion of their aquaculture portfolio for which they have reported Scope 3 emissions.

Attribution of emissions

For the attribution of emissions, there are formulas for the respective asset class, i.e. listed equity and corporate bonds, business loans and unlisted equity, or project finance, depending on what is being financed.

Data and data quality

The denominator of the attribution factor formula is the value of the aquaculture company. In line with the PCAF standard, these guidelines recommend using Enterprise Value Including Cash (EVIC) for aquaculture companies. If financial institutions do not have access to EVIC, the PCAF standard allows for the use of balance sheet values. In aquaculture, the market value of licences is often significantly higher than their book values, and licences constitute a substantial portion of the market value of aquaculture companies. Therefore, if financial institutions do not have access to EVIC but have access to both market and balance sheet values of licences, these guidelines recommend using the balance sheet value of the company minus the balance sheet value of the licences plus the market value of the licences. If financial institutions do not have access to the balance sheet and market values of licences, use the balance sheet value of the company.

The revenue of aquaculture companies is highly correlated with the prices they receive for the products they sell. Fish prices are very volatile, and it is considered much better to use estimates of emissions per production unit than per revenue. In this regard, based on SINTEF's report *"Greenhouse gas emissions of Norwegian salmon products"*, these guidelines have developed emission estimates per production unit.[100]

In direct communication with the authors of the study, Finance Norway has gained access to the underlying data for various parts of the life cycle assessments separately (see Figure 6-2 in the SINTEF report). The two largest drivers of total emissions from aquaculture, transportation and feed, fall within Scope 3. If financial institutions use the SINTEF report as a source, it can be challenging to distinguish between the aquaculture company's Scope 1 and Scope 2 emissions. If financial institutions combine the contributions from the respective life cycles, i.e. "juvenile", "grow out", "harvest plan" and "packaging", they will arrive at an estimate of the sum of Scope 1 and Scope 2 emissions.

Product and freight	Feed	Juvenile	Grow out	Harvest plant	Packaging	Export	Total
Fresh gutted to Paris by truck	3.2	0.2	0.9	0.1	0.2	0.4	5.0
Fresh gutted to Tokyo by air	3.9	0.2	1.1	0.1	0.3	11.6	17.2
Fresh fillet to US by air	3.5	0.2	1.0	0.1	0.2	12.4	17.3
Fresh fillet to Tokyo by air	3.4	0.2	0.9	0.1	0.2	11.5	16.3

Note that the table below contains factors for kg CO_2e per kg of goods.

***Table 14** – Greenhouse gas emissions for different parts of the value chain for different aquaculture products.*[101]

100) SINTEF – Greenhouse gas emissions of Norwegian salmon products
101) Ibid (Figure 6-2. Data received directly from the authors)

The examples of fillets transported to the US and Tokyo by air freight are "*C-trim fillet*", while the top two examples are Head-on Gutted (HOG). Aquaculture companies usually report production volume in HOG. To convert from HOG to "*C-trim fillet*", a factor of 0.670 can be used.[102]

In some situations, financial institutions may only have information about Maximum Allowed Biomass and not the production volume. The average ratio between Maximum Allowed Biomass and production volume was relatively stable in the period from 2012 to 2017, but with significant variations between different locations.[103] If financial institutions have access only to Maximum Allowed Biomass and not production volume, they can use a factor of 1.55 for Atlantic salmon.[104] This factor is merely a suggestion based on the 2021 average, and financial institutions are free to choose other factors for estimating production volume based on Maximum Allowed Biomass.

Estimated production volume = Maximum Allowed Biomass x 1.55

Information regarding Maximum Allowed Biomass is available in the Aquaculture Register.[105]

Data quality	Calculation method	Alt.	Variable
1	Aquaculture company's emissions based on company reporting	1a	Company's emissions, verified.
2		1b	Company's emissions, not verified.
3	Aquaculture company's emissions based on physical production volume	2a	Company's emissions based on production volume and emission factors per production unit.
		2b	Production volume is estimated using Maximum Allowed Biomass. Company's emissions are estimated based on production volume and emissions per production unit.
5	Aquaculture company's emissions based on company revenue	3	Company's emissions based on revenue and emission factors per revenue unit.

***Table 15** – Data hierarchy for aquaculture.*

102) Ibid (Table 3-13 and Table 0-2. Factor from HOG to "*C-trim fillet*" is 0.558 divided by 0.833=0,670)
103) University of Stavanger, Grunnrenteskatt i havbruk – Et kunnskapsgrunnlag. Faglig sluttrapport, 201 (Resource rent tax on aquaculture – A knowledge base. Final report, 201).

Financial institutions should provide a weighted average for data quality in their aquaculture portfolio.

Equations to calculate financed emissions

The attribution factor is calculated as follows:

$$\text{Attribution factor}_c = \frac{\text{Outstanding amount}_c}{\text{Value of the aquaculture company}_c}$$

Where *c* is for company c.

The prioritised order for determining the value of an aquaculture company is as follows:

1. EVIC
2. The balance sheet value of the company minus the balance sheet value of its licences plus the market value of the licences.
3. The balance sheet value of the company.

The general formula for financed emissions for aquaculture is:

$$\text{Financed emissions} = \sum_c \text{Attribution factor x Aquaculture company's emissions}_c$$

Where *c* is for company c.

104) The factor of 1.55 has been calculated by using sales statistics for Atlantic salmon from the Norwegian Directorate of Fisheries for 2021, obtained from the Excel file "*Salg 1994–2021*" (Sales 1994–2021) (cell E24), multiplying this by a conversion factor of 0.89 to convert from Whole Fish Equivalent (WFE) to Head-On-Gutted (HOG) and dividing this from the total MAV from the tab "*Produksjonsområde*" (Production area) from the Excel file "*Antall tillatelser 1994–2022*" (Number of permits 1994–2022) (cell E29). The conversion factor from WFE to HOG is taken from the definitions provided by the Norwegian Directorate of Fisheries.
105) Aquaculture Register

B. Agriculture

Definition of the sector

The sector-specific recommendations for agriculture apply to exposures to the agriculture sector in Norway. These recommendations can be viewed as a supplement to the business loans and unlisted equity asset class.

The agriculture sector refers to individuals or companies that are active producers. It should be noted that some bank customers are registered under NACE codes for agriculture who are no longer active producers but are involved in "*hobby farming*" For these exposures, these guidelines recommend using the calculation for personal loans.

Emissions scopes covered by the sector-specific recommendations

Scope 1 and Scope 2 emissions.

Coverage

The ideal scenario is that all exposures in line with the sector definition are covered. There will likely be varying data quality for different parts of the portfolio. The section on "*data and data quality*" section provides recommendations on how to highlight this.

Attribution of emissions

The financial institution's share of emissions is calculated based on the financial institution's outstanding amount to the agricultural customer in relation to the value of the customer's collateral. There are no Norwegian agricultural customers large enough for financial institutions to have access to Enterprise Value Including Cash (EVIC) for use in the denominator of the attribution factor.

Instead, these guidelines recommend distributing the emissions in line with the customer's loan-to-value ratio (LTV). The loan-to-value ratio is calculated based on each bank's valuation model for agriculture. These valuation models typically include the farmer's house. In Norway, bank financing of agriculture is typically a combination of the house and the farming operation, usually without the bank's ability to identify how the loan is used. In practice, the financing ratio is therefore common for both the house and the farming operation.

If financial institutions report on removals by forests (forest carbon sequestration), this should be done separately from other greenhouse gas reporting. Net emissions, where financial institutions subtract these sequestrations from emission activities, should not be calculated.

106) Climate Calculator from Landbrukets Klimaselskap SA
107) Platon – Klimagassutslipp fra norsk jordbruk fordelt på areal, dyr og matproduksjon (2022) (Greenhouse gas emissions from Norwegian agriculture distributed by area, livestock and food production)

Data and data quality

These guidelines have identified three different methods for calculating emissions from agricultural exposures:

1. Use of the Climate Calculator from Landbrukets Klimaselskap SA (data quality 2)

The Climate Calculator from Landbrukets Klimaselskap SA is a tool for farmers developed by the entire Norwegian agriculture sector.[106] It retrieves data from Landbrukets Dataflyt and is the closest thing to an automated climate account per farmer. Currently, it's voluntary for farmers to use the Climate Calculator, and indications from the agriculture sector suggest that it may take a few years before it becomes widespread. The speed of adoption will depend on factors like how many buyers of farmers' goods and banks impose such requirements, as well as regulatory developments.

2. The use of factors from national research reports on emissions from Norwegian agriculture (data quality 3)

If financial institutions don't have access to engagement-specific data from the Climate Calculator, these guidelines recommend using factors from the Platon report *"Klimagass-utslipp fra norsk jordbruk fordelt på areal, dyr og matproduksjon"*[107] (Greenhouse gas emissions from Norwegian agriculture distributed by area, livestock and food production) (see also table 16 and table 17). The factors from the Platon report have been slightly adjusted in connection with these guidelines to fit the information that financial institutions have about their agricultural engagements. The factors from the Platon report consist of three different groups of emissions: emissions from agriculture, emissions from energy use (fuel from agricultural machinery and heating) and emissions from land use (Land-Use, Land-Use Change and Forestry, LULUCF).

In the work on these guidelines, Finance Norway identified the need to find different factors than those from the PCAF database, as the latter significantly overestimates emissions for Norwegian agricultural engagements. For example, SpareBank 1 Østlandet and SpareBank 1 SR-Bank reported total financed agricultural emissions of 1.2 million tonnes of CO_2e in 2021 (using factors from the PCAF database). If one assumes a simplified 50 per cent financing rate, it means that the agricultural emissions of these two banks at the 100 per cent level are about 2.4 million tonnes of CO_2e, approximately 1/3 of the total national emissions from the sector, which are slightly over 7 million tonnes of CO_2e. This significantly exceeds these two banks' total national market shares in agriculture, clearly indicating that PCAF factors significantly overestimate emissions for Norwegian agriculture.

Livestock-based emissions	Production codes	Factor [tonnes CO_2e per animal per year]	Factor excl. diesel consumption[108] [tonnes CO_2e per animal per year]
Dairy cows	P120, P801	5.01286	4.59222
Beef cows	P121, P802	3.17495	2.98812
Other cattle[109]	P119, P803	3.13863	2.91229
Sheep[110]	P139, P145–146, P821	0.36855	0.34662
Pigs	P154–159, P830–831	0.11426	0.10870
Goats	P140–144, P810–811	0.49704	0.42335
Deer	P178–179	0.61965	0.61965
Horses	P115–116	1.11503	1.11503
Laying hens	P161, P841	0.00143	0.00101
Broiler chicks (number of placements)	P175	0.00101	0.00101
Broilers (number of placements)	176, P840	0.00111	0.00101
Ducks, turkeys and geese	P168, P174	0.00111	0,00101
Other small animals	P170–171	0,02925	0,02925

Table 16 – Factors for animal-based emissions in agriculture based on the Platon report.

Area-based emissions	Production codes	Factor [tonnes CO_2e per 1,000 m^2 per year]	Factor [tonnes CO_2e per 1,000 m^2 per year] excl. diesel consumption[111]
Wheat	P240, P247	0.38846	0.367856
Rye	P238	0.37621	0.355606
Barley	P242	0.38541	0.364806
Oats	P243	0.36957	0.348966
Oilseed crops	P237	0.38794	0.367336
Legumes	P236, P245	0.29000	0.269396
Forage seeds and other seeds	P235	0.35341	0.332806
Grain for crushing	P239, P855	0.37475	0.354146
Other cereals and seeds	P231	0.32007	0.299466
Fruit	P270–279, P283, P863	0.37513	0.297468
Berries	P280, P282	0.38980	0.312138
Open field vegetables	P264, P864	1.65925	1.634101
Potatoes	P230, P861	2.27486	2.219291
Roughage on cultivated land	P210, P870, P881	0.39984	0.39984
Roughage on surface-cultivated land	P211	0.23326	0.23326
Enclosed pastures	P212, P871, P880	0.18086	0.18086
Other roughage for feed	P213	0.12482	0.12482

Table 17 – Factors for area-based emissions in agriculture based on the Platon report

108) From table 1 in the Platon report diesel-related CO_2 emissions are 293,000 tonnes. This can be found in the report's table 12, the left-hand section as emission factors in the column for energy consumption (summing up in the right-hand section of the table to 398,000 tonnes; diesel 293,000 + vegetables in greenhouses 105,000). These factors are subtracted from the total to find emissions excluding diesel.

109) Weighted average of the Platon categories: a) heifers for breeding, b) heifer calves for slaughter <1 year, c) steer calves for slaughter <1 year, d) heifer calves for slaughter >1 year, e) steer calves for slaughter >1 year.

110) The number of sheep and lambs in the subsidy database (data.norge.no) and in the Platon calculations is arrived at using different methodologies. When both lambs and sheep from the subsidy database are considered, the count is significantly higher than what was used in the Platon report. The combination of subsidy count and Platon factor for sheep/lambs significantly inflates the result. The simplification chosen for the sake of getting closest to the total emissions is to use the Platon factor only for sheep and thus exclude lambs. However, the diesel adjustment is done as an average between > 1 year and < 1 year.

111) See corresponding note for table 16 (note 108)

Area-based emission removals	Factor [tonnes CO_2e per 1,000 m^2 per year]
Forests	minus 0.2959[112]

Table 18 – Factor for area-based removals by forests (forest carbon sequestration)

In the process of creating these guidelines, Finance Norway cross-referenced data for all subsidies to Norwegian agriculture and calculated the total emissions of Norwegian agriculture using the factors mentioned above. The margin of error was approximately a 10 per cent overestimation, which is considered acceptable.

Data for cultivated land and the number of animals can be downloaded from the National Data Catalog (data.norge.no) as tables of subsidies in agriculture.[113] This data is updated twice a year. There is somewhat less information on productive forests but this can also be downloaded from the National Data Catalog.[114] At the time of writing, the last update was in 2017.

Financial institutions have different practices when it comes to categorising emissions from agricultural machinery. Some include this in emissions from the agriculture sector, while others include it in the motor vehicles asset class. The factors in tables 16 and 17 are provided as both complete factors (i.e. including diesel consumption from agricultural machinery) and factors excluding diesel consumption.

3. Use of international databases such as the PCAF database

If financial institutions have an engagement where they don't have access to data from the Climate Calculator from Landbrukets Klimaselskap SA and the above-mentioned factors for emissions do not fit, these guidelines recommend using data from international databases, such as the PCAF database. The PCAF database contains Scope 1 emissions with production-based emission factors, but not all types of production are included, as well as factors based on economic activity. The factors from the PCAF database based on production (alternative 2b from the data hierarchy) are of higher quality than those based on emissions per economic activity (alternatives 3a and 3b from the data hierarchy). PCAF factors based on turnover (data quality 4) may be relevant for companies (private limited liability/co-operatives) and some forestry customers, as they do not receive subsidies and are not in the subsidy database. For sole proprietorships, turnover is less accessible, and calculation method 3b from the data hierarchy, with emissions based on the on-balance sheet value (data quality 5), may be more suitable if financial institutions do not have data for alternatives 1 or 2.

Data quality	Calculation method	Alt	Variable
1	Actual emissions from agriculture	1a	Calculated emissions based on verified data at the engagement level.
2		1b	Calculated emissions based on data arrived at through the Climate Calculator from Landbrukets Klimaselskap SA.
3	Calculated emissions based on production and area factors	2a	Calculated emissions based on high-quality production and area factors, such as factors described in these guidelines.
		2b	Calculated emissions based on production factors in the PCAF database.
4	Calculated economic activity-based emissions	3a	Calculated emissions based on emission factors based on turnover in the PCAF database.
5		3b	Calculated emissions based on emission factors per on-balance sheet value in the PCAF database.

Table 19 – Data hierarchy for agriculture.

Financial institutions should provide a weighted average for data quality in their agriculture portfolio.

Equations to calculate financed emissions

The attribution factor is calculated as follows:

$$\text{Attribution factor}_c = \text{LTV}_c = \frac{\text{Outstanding amount}_c}{\text{Valuation of agriculture customer}_c}$$

Where *c* is for customer c.

The general equation for financed emissions for agriculture is:

$$\text{Financed emissions} = \sum_c \text{Attribution factor} \times \text{Customer's emissions}_c$$

Where *c* is for customer c.

112) Net removals by forests (from the Norwegian Institute of Bioeconomy Research (NIBIO)) divided by the number of 1,000 m^2 of productive forest (from Statistics Norway (SSB)): Minus 24.5 mill/82.8 mill = minus 0.2959 CO_2e per 1,000 m^2 per year

113) National Data Catalog – Produksjons- og avløsertilskudd til jordbruksforetak – søknadsomgang 2022 (Production and relief subsidies for agricultural enterprises – application round 2022)

114) National Data Catalog – Landbrukseiendommer i Landbruksregisteret (2017) (Agricultural properties in the Agriculture Register (2017))

When using production-based and area-based emission factors, the agricultural customer's emissions are calculated by summing up the production-based and area-based emission factors. Note that removals by productive forest (carbon sequestration) should not be included in this calculation but should be reported separately.

$$\text{Agriculture customer's emissions}_c = \sum_d \begin{matrix}\text{Number of animals}_{c,d} \text{ x emission factor}_d + \sum \text{Area of cultivated land}_{c,a} \\ \text{x Emission factor for cultivated land}_a\end{matrix}$$

Where *d* is for animal type d and *a* is for area a.

$$\text{Financed emissions} = \sum_c \left(\text{LTV}_c \text{ x } \begin{matrix}(\sum_d \text{Number of animals}_{c,d} \text{ x Emission factor}_d + \sum_a \text{Area of cultivated land}_{c,a} \\ \text{x Emission factor for cultivated land}_a)\end{matrix} \right)$$

Where *c* is for customer c, *d* is for animal type d and *a* is for area a.

Matters of particular relevance for agriculture

Please note that greenhouse gas calculations estimated using factors based on the Platon report will result in significant errors at the engagement level and should therefore not be used as a tool against individual customers. On a portfolio level, however, the model is considered to be a good approach.

C. Oil and gas

Definition of the sector

The sector-specific recommendations for oil and gas apply to all exposures to the oil and gas sector, defined according to NACE code B6 (extraction of crude petroleum and natural gas) and B9.1 (support activities for petroleum and natural gas extraction). These recommendations can be viewed as a supplement to the asset classes of listed equity and corporate bonds, business loans and unlisted equity, and project finance.

Emissions scopes covered by the sector-specific recommendations

Scope 1, Scope 2 and Scope 3 emissions.

The PCAF standard states that for oil and gas exposures, financial institutions should also report on Scope 3 emissions. For the extraction and production of oil and gas, Scope 3 emissions are material (especially subcategory 11, *"use of sold products"*). The magnitude of Scope 3 emissions resulting from the extraction and production of oil and gas depends significantly on their end use. Oil and gas used for purposes such as plastic production, asphalt or lubricants produce different greenhouse gas emissions in the consumption phase than oil and gas used for energy purposes. To calculate Scope 3 emissions for the extraction and production of oil and gas, it is highly advantageous to know the end use of the oil and gas. In PCAF's own database, there are no estimates for downstream Scope 3 emissions.

When reporting on Scope 3 emissions, it should be clearly distinguished from Scope 1 and Scope 2 emissions.

Coverage

Financial institutions must disclose the proportion of their oil and gas exposure for which they have calculated financed emissions. If financial institutions report on Scope 3 emissions, they should clearly describe the proportion and the part of the oil and gas portfolio for which they have reported Scope 3 emissions.

The oil service sector is often divided into two parts: capital-light and capital-intensive. The capital-light part of the oil service sector includes activities such as *design and engineering work*. The capital-intensive part includes activities like drilling rigs and supply vessels.

There are significant differences in Scope 1, Scope 2 and Scope 3 emissions within the oil service sector. For example, some oil service companies, especially in the capital-light segment, may have low Scope 3 emissions. If financial institutions use discretion and choose not to calculate Scope 3 emissions from these companies, they should clearly disclose this and provide their reasoning for this decision.

Many financial institutions have strategies to achieve net-zero emissions, and these strategies often include financed emissions. For those financial institutions with such strategies but lacking Scope 3 emissions data from their oil and gas exposures, it is advisable to include an explanation of how they plan to obtain this data in the future.

Attribution of emissions

For the attribution of emissions, financial institutions use either the asset class of listed equity and corporate bonds, business loans and unlisted equity or project finance, depending on what is being financed. The financial institution's outstanding amount to the oil and gas company or project is used in the numerator, and the value of the oil and gas company or project is used in the denominator. If the financial institution has access to Enterprise Value Including Cash (EVIC), this is the preferred measure of value. If the financial institution does not have access to EVIC, the on-balance sheet value can be used.

Data and data quality

On the Norwegian continental shelf, the data quality for greenhouse gas emissions is very good. However, there are some challenges related to the standard for attributing emissions from "satellite fields" where oil and gas is transported back to a permanent installation for processing ("*sub-sea tie-back*").

Emissions from the Norwegian continental shelf can be calculated by compiling data from the Norwegian Environment Agency on emissions from the various oil and gas fields,[115] along with ownership information for these fields from the Ministry of Petroleum and Energy.[116]

For operations outside the Norwegian continental shelf, there are often challenges with some companies only reporting emissions from fields where they have operational control and not reporting emissions based on ownership interests in fields.

Several data providers offer data on emissions from the oil and gas sector. Data from such providers may vary in quality according to the PCAF standard's data hierarchy. Financial

115) The Norwegian Environment Agency – Overview of enterprises with reported emission figures in Norway (offshore petroleum activities)
116) The Norwegian Petroleum Directorate – Fact Pages on the Norwegian continental shelf (search for relevant field)

institutions should understand the data quality score of the data they purchase and be transparent about this, as well as whether the data provider can confirm that the data complies with the Greenhouse Gas Protocol.

There are a number of major oil and gas companies who disclose Scope 2 emissions. If a company does not report on Scope 2 emissions but provides information on electricity consumption, or if it is possible to estimate electricity consumption, financial institutions can calculate Scope 2 emissions using the location-based method (see the chapter on "*Emission intensity for electricity*"). These guidelines recommend using the location-based method based on the same considerations as outlined in the chapter on "Emission factors for electricity". It should be noted that the Norwegian Environment Agency's report *"Green transition: Climate action analysis for petroleum, industry and the energy supply"*[117] does not take into account the purchase of guarantees of origin in its analysis, which supports the use of the location-based method.

There are several ways to estimate Scope 3 emissions from oil and gas extraction and production, and financial institutions encourage oil and gas companies to find common methods for calculating their Scope 3 emissions. (ref. conclusion of the DNV report "*A common knowledge base for the energy industry*"[118]). Both CDP[119] (formerly Carbon Disclosure Project), IPIECA[120] (expected to be updated in 2023), and the Transition Pathway Initiative (TPI)[121] have published detailed guidelines on how companies in the oil and gas sector can calculate their Scope 3 emissions. It is important to emphasise that oil and gas companies have the best expertise on their own emissions, and financial institutions should encourage these companies to report on their Scope 3 emissions themselves.

If oil and gas companies do not report their own Scope 3 emissions, financial institutions can obtain this data from data providers or estimate it themselves. In such cases, financial institutions should enquire about the assumptions made by the data provider and be transparent about this. For Scope 3 emissions in the oil and gas sector, the main driver is sub-category 11, "*use of sold products*".

Method for estimating emissions in Scope 3, sub-category 11, based on emissions from the combustion of oil and gas from the IPCC

If financial institutions wish to estimate Scope 3 emissions, sub-category 11, for an oil and gas company, they can, for example, use factors from the United Nations' Intergovernmental Panel on Climate Change (IPCC).

The IPCC calculates that the combustion of oil and gas from a stationary combustion engine in the energy sector emits 73,300 and 56,100 kg CO_2/TJ, respectively (methane and nitrous oxide emissions can be ignored as they are very small).[122] 1 barrel of oil equivalent (boe) corresponds to 0.0061178632 TJ. This means that the combustion of 1 boe of oil and gas emits 448.4 kg CO2e and 343.2 kg CO_2e, respectively. This is close to what the International Energy Agency (IEA) has estimated, with 440 kg CO_2e for heavy fuel oil and 320 kg CO_2e for natural gas.[123]

If financial institutions have exposures to companies on the Norwegian continental shelf that do not report production volumes separated by oil and gas, they can use an average of production from the Norwegian continental shelf.[124]

It's important to note that an estimation based on the IPCC's combustion values from a stationary combustion engine in the energy sector is a simplification and a method that does not account for various uses of oil and gas (e.g. for asphalt, the petrochemical industry, lubricating oil etc.), methane leaks in transportation and distribution, or differences between different combustion engines.

Data quality	Calculation method	Alt	Variable
1	Reported emissions	1a	Verified, reported emissions
2		1b	For example, emission estimates from the Norwegian continental shelf based on reports from the Norwegian Environment Agency and the Ministry of Petroleum and Energy.
3	Calculated emissions based on physical production data	2a	Calculated emissions based on physical production data and associated emission factors. For example, the estimation of Scope 3 emissions from the extraction and production of oil and gas based on assumptions from the IPCC.
4	Calculated economic activity-based emissions	3a	Calculated emissions based on company revenue and sector-specific emission factors per revenue
5		3b	Calculated emissions based on company on-balance sheet values and sector-specific emission factors per unit of value

***Table 20** – Data hierarchy for oil and gas.*

Financial institutions should provide a weighted average for data quality in their oil and gas portfolios.

117) The Norwegian Environment Agency: "*Grønn omstilling: Klimatiltaksanalyse for petroleum, industri og energiforsyning*" (Green transition: Analysis of climate measures for petroleum, industry and the energy supply)
118) DNV: *A common knowledge base for the energy industry* (free, men requires registration) 119) CDP Technical Note: Guidance methodology for estimation of Scope 3 category 11 emissions for oil and gas companies
120) PIECA: Estimation petroleum industry value chain (Scope 3) greenhouse gas emissions
121) TPI: Carbon Performance assessment of oil and gas producers: note on methodology
122) IPCC Table 2.2 Default emission factors for stationary combustion in the energy industry
123) IEA – "*The oil and gas industry in energy transition*" (2020)
124) The Norwegian Petroleum Directorate – Facts Pages, yearly production

Equations to calculate financed emissions

The attribution factor is calculated as follows:

$$\text{Attribution factor}_c = \frac{\text{Financial exposure to the oil company}_c}{\text{Oil company's value}_c}$$

Where *c* is for company c.

The prioritised order for determining the value of an oil and gas company is as follows:

1. EVIC
2. On-balance sheet value of the company

The general equation for financed emissions for oil and gas companies is

$$\text{Financed emissions} = \sum_c \text{Attribution factor}_c \times \text{Oil company's emissions}_c$$

Where *c* is for company c.

Together, this makes:

$$\text{Financed emissions} = \sum_c \frac{\text{Financial exposure to the oil company}_c}{\text{Oil company's value}_c} \times \text{Oil company's emissions}_c$$

Where *c* is for company c.

Next steps

For the oil and gas sector, downstream emissions, especially emissions in sub-category 11, "*use of sold products*", are significant. The DNV report from 2022 "*Scope 3 emissions: A common knowledge base for the energy*" (can be downloaded free of charge if one registers on the site) states that it is a challenge that different companies in the sector calculate their Scope 3 emissions in different ways. In an updated version of these guidelines, it would be natural to explore how the financial services industry can collaborate with the oil and gas sector to develop better estimation methods and influence the oil and gas sector to report their Scope 3 emissions in a way that makes them comparable across companies.

The way forward

The foreword to these guidelines states that these guidelines are a starting point and not the final destination. Finance Norway aims to update and further develop these guidelines in line with the needs of its members and international developments in the field.

In the course of creating these guidelines, Finance Norway and its members have identified certain topics that would benefit from more in-depth exploration, as well as issues that require follow-up involving public authorities. For instance, Finance Norway plans to work towards improving access to energy performance data for residential and commercial buildings. In the case of residential buildings, the focus is primarily on increasing coverage and quality of energy performance certificates, while for commercial real estate, it is possible to foresee financial institutions gaining access to actual consumption data from Elhub.

Finance Norway has also experienced that there are challenges in obtaining data of the desired quality regarding the Scope 3 emissions from the financial services industry's investments and customers. As the PCAF standard gradually includes the Scope 3 emissions for exposures, this challenge is becoming more significant. Finance Norway intends to examine this matter more closely in an updated version of these guidelines.

While it would have been desirable to provide guidance on how financial institutions should handle exposures to municipalities and county municipalities, Finance Norway is not aware of any international best practices in this regard at present. When such practices become available, they will naturally be included in an updated version.

PCAF Nordic will, among other things, work towards harmonising various Nordic initiatives and maintain close contact with the PCAF Secretariat. Building on the work on these guidelines, Finance Norway will propose asset classes, sector-specific recommendations and high-quality data sources for PCAF Nordic, allowing these to be further developed for PCAF globally.

These guidelines are an example of what can be achieved in the Norwegian financial sector through collaboration. Finance Norway extends its gratitude to all those involved in contributing to these guidelines and looks forward to continuing this collaboration as it evolves and is updated.

Finance Norway