The GLOBAL GHG ACCOUNTING & REPORTING Standard

PART A

Financed Emissions

For financial institutions measuring and reporting scope 3 category 15 emissions

PCAF®
Partnership for Carbon Accounting Financials

Third Edition
December 2025

The first edition of this Financed Emissions Standard (November 2020) has been reviewed by the GHG Protocol and is in conformance with the requirements set forth in the Corporate Value Chain (Scope 3) Accounting and Reporting Standard, for Category 15 investment activities. The Built on GHG Protocol mark was subsequently granted to the following six asset classes: Listed Equity and Corporate Bonds, Business Loans and Unlisted Equity, Project Finance, Commercial Real Estate, Mortgages, and Motor Vehicle Loans. As the GHG Protocol has since closed its Built on GHG Protocol review service, the additions to the second edition of the Financed Emissions Standard (December 2023), as well as all new methodologies and guidance introduced in the December 2025 edition, have not yet been reviewed by the GHG Protocol.

Please cite this document as:
PCAF (2025). The Global GHG Accounting and Reporting Standard Part A: Financed Emissions. Third Edition.

Table of Contents

Acknowledgements 4

Executive Summary 5

1. Introduction 7

2. The importance of GHG accounting 13

3. Supporting goals through GHG accounting 18

4. Principles and requirements for GHG accounting for financials 24

4.1 GHG accounting requirements derived from the GHG Protocol's principles 24

4.2 Additional requirements for accounting and reporting financed emissions 26

5. Methodology to measure financed emissions 33

5.1 Listed equity and corporate bonds 39

5.2 Business loans and unlisted equity 54

5.3 Project finance 66

5.4 Commercial real estate 76

5.5 Mortgages 82

5.6 Motor vehicle loans 89

5.7 Use of proceeds structures 98

5.8 Securitization and structured products 110

5.9 Sovereign debt 139

5.10 Sub-sovereign debt 149

6. Reporting requirements and recommendations 161

6.1 Overall reporting requirements and recommendations 161

6.2 Optional reporting on undrawn loan commitment according to IFRS S1 & S2 170

7. Glossary 176

8. Acronyms 185

9. References 188

10. Annex 191

10.1 Detailed data quality score tables per asset class 191

10.2. Sample table template displaying reported emissions for a given fiscal year 194

10.3 Supplementary information for Sovereign Debt 201

Acknowledgements

This Financed Emissions Standard was developed through collaboration with over one hundred stakeholders representing the Partnership for Carbon Accounting Financials (PCAF). These stakeholders include PCAF's Global Core Team members, PCAF Working Group members, the PCAF Board and its Secretariat.

PCAF is thankful to its Global Core Team for their leadership and guidance in shaping this revised Standard. Their expertise and commitment have been essential to ensuring its integrity and alignment with PCAF's mission. The Core Team governing the updates to this Financed Emissions Standard is comprised of individuals who work at the following financial institutions:[1]

- **Commonwealth Bank of Australia**
- **EIG**
- **HSBC**
- **ING**
- **Itaú Unibanco**
- **Metrics Credit Partners**
- **Mizuho Financial Group**
- **Morgan Stanley**
- **NMB Bank**
- **Nordea Group**
- **Phoenix Group**
- **PIMCO**
- **Swiss Re**
- **United Bank for Africa**

PCAF acknowledges the significant contributions of more than 100 industry experts from its signatory base who participated in working groups to develop methods and undertake a rigorous review process following the 2024 public consultation. Their technical insights and sustained engagement throughout the two-year development cycle were critical to integrating feedback and strengthening the guidance and methodologies presented in this updated Standard.

In addition, we extend our thanks to all those who participated in the public consultation, providing valuable comments and feedback that informed and improved this Financed Emissions Standard.

Our thanks further extend to the PCAF Board of Directors for their efforts to convene the Core Team and for providing strategic guidance in the direction of the PCAF Standard's expansion.

Finally, we want to thank Bloomberg Philanthropies, Sequoia Climate Foundation, Climate Arc, and the Laudes Foundation for their generous support of this work.

The PCAF Secretariat is operated by Guidehouse, a global consultancy firm specializing in energy, sustainability, risk, and compliance for the financial industry.

[1] The Core Team's contributions to this Standard have been made on an individual level rather than institutional level. The content set out within this Standard and any views expressed do not necessarily represent the views of each individual Core Team member or the institutions they work for.

Executive Summary

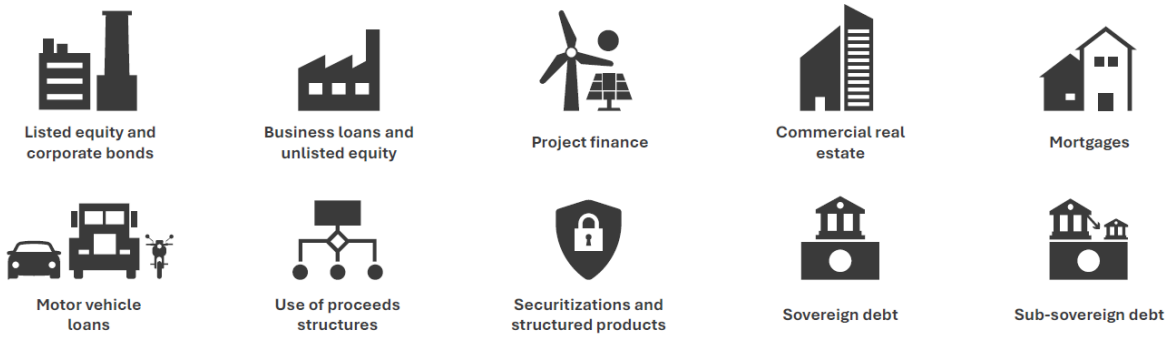
The Partnership for Carbon Accounting Financials (PCAF) is an industry-led initiative created in 2015 to harmonize greenhouse gas (GHG) accounting and reporting across the financial sector. PCAF enables financial institutions to measure and disclose the greenhouse gas emissions associated with their financial activities through GHG accounting.

Financed emissions represent the largest share of financial institutions' climate impact. Measuring these emissions is the foundation for effective risk management, disclosure, and informed decision making. By applying PCAF's methodologies, financial institutions can improve transparency, comparability, and data quality, supporting robust risk assessment and alignment with leading disclosure frameworks.

Responding to industry demand for a standardized GHG accounting approach, PCAF developed the Global GHG Accounting and Reporting Standard for the Financial Industry in 2020, covering six asset classes. This third edition builds on previous versions and introduces updates, including:

- Four new methodologies for use of proceeds structures, securitizations and structured products, sub-sovereign debt, and an optional IFRS reporting of undrawn loans.
- Updates and improvements to the second version of the Standard.
- Two new reporting recommendations – a fluctuation analysis and inflation adjustment – developed in response to feedback on the Inventory Fluctuation discussion paper (2024).

With these additions, this latest version of the Financed Emissions Standard assists in the measurement and disclosure of GHG emissions associated with ten asset classes:



This third edition of the Financed Emissions Standard equips financial institutions with robust, standardized methodologies to measure and disclose financed emissions across an expanded set of asset classes. By applying these methods, institutions can assess their exposure to emissions-related financial risks in alignment with leading disclosure frameworks, establish measurable baselines to inform internal targets and risk management practices, report consistently to stakeholders using transparent and comparable data, and integrate emissions insights into portfolio analysis and strategic decision-making. Together, these capabilities strengthen transparency, comparability, and accountability across the financial sector, supporting informed action toward managing climate-related risks and opportunities.

Introduction

PCAF®
Partnership for
Carbon Accounting
Financials

1. Introduction

THE ROLE OF THE FINANCIAL SECTOR

The financial sector plays a critical role in strengthening transparency and accountability in how greenhouse gas (GHG) emissions are measured and reported across portfolios. Reliable emissions data helps financial institutions better understand their exposure to emissions-related risks and dependencies within their lending, investment, underwriting, and re/insurance activities.

The GHG emissions of financial activities (scope 3 category 15) are the largest portion of financial institutions' overall emissions. Measuring these emissions provides a foundation for risk assessment, disclosure, and performance tracking. Through standardized methodologies, financial institutions can identify highest emitters in their portfolios, improve reporting accuracy, and integrate these insights into decision-making and portfolio management. This approach fosters informed dialogue between financial institutions, regulators, and stakeholders, strengthens market confidence, and promotes consistent, data-driven strategies for managing emissions across the financial industry.

THE ROLE AND HISTORY OF PCAF

Prior to the establishment of the Partnership for Carbon Accounting Financials (PCAF), financial institutions relied on varied approaches and accounting methodologies to measure financed emissions and used different reporting metrics, which led to inconsistent assessments of the industry's climate impact. This lack of standardization hampered transparency, comparability, and accountability across the financial sector.

PCAF was established to harmonize greenhouse gas (GHG) accounting and disclosure across the financial sector. It provides standardized methodologies that enable financial institutions to assess the GHG emissions associated with their loans, investments, (re)insurance underwriting, and other financial products and services. Founded in 2015 by Dutch financial institutions, PCAF expanded to North America in 2018 and scaled globally in 2019.[2] Today, this industry-led initiative has grown to include more than 670 financial institutions worldwide (as of November 2025),[3] all committed to measuring and disclosing the GHG emissions of their portfolios. PCAF fosters collaboration among financial institutions to improve GHG methodologies for the financial sector, building a community focused on shared knowledge and action.

PCAF is led by the Board of Directors which consists of Justine Bolton (FirstRand Limited), Dinesh Dulal (NMB Bank), Ivan Frishberg (Amalgamated Bank), Prajña Khanna (Naspers-Prosus Group), Tjeerd Krumpelman (former ABN AMRO), James Niven (Global Alliance for Banking on Values), Peter Sandahl (Nordea Group), and Alison Vipond (former Lloyds Banking Group).

Responding to industry demand for a global, standardized GHG accounting and reporting approach, PCAF developed the Global GHG Accounting and Reporting Standard for the Financial Industry in November

[2] More information about PCAF is found at: https://carbonaccountingfinancials.com/
[3] A full list of PCAF participants is found at: https://carbonaccountingfinancials.com/financial-institutions-taking-action#overview-of-institutions

2020. This first edition provided detailed methodological guidance to measure and disclose GHG emissions associated with six asset classes: listed equity and corporate bonds, business loans and unlisted equity, project finance, commercial real estate, mortgages, and motor vehicle loans.

Since then, financial institutions called for additional methods to cover other financial activities. In response, PCAF began work on three parts under the umbrella of the Global GHG Accounting and Reporting Standard for the Financial Industry:

- Part A: development of a standard for measuring and reporting the GHG emissions associated to loans and investments ("Financed Emissions Standard – first-, second-, and third-edition")
- Part B: development of a standard for measuring and reporting the GHG emissions associated to the capital market facilitation activities ("Facilitated Emissions Standard")
- Part C: development of a standard for measuring and reporting the GHG emissions associated to re/insurance underwriting ("Insurance-Associated Emissions Standard – first-, and second-edition")

This document updates the second Financed Emissions Standard published in 2023, and includes:

- New methodologies for use of proceeds structures, securitization and structured products, sub-sovereign debt, and an optional IFRS reporting of undrawn loans.
- Updates and improvements to the second version of the Standard.
- Two new reporting recommendations—a fluctuation analysis and inflation adjustment—in response to feedback on the Inventory Fluctuation discussion paper.

The first edition of this Financed Emissions Standard (November 2020) has been reviewed by the GHG Protocol and is in conformance with the requirements set forth in the Corporate Value Chain (Scope 3) Accounting and Reporting Standard, for Category 15 investment activities. As the GHG Protocol has closed its Built on GHG Protocol review service, the additions to the second edition of the Financed Emissions Standard (December 2023), as well as all new methodologies and guidance introduced in the December 2025 version, have not been reviewed by the GHG Protocol.

THE ROLE OF GHG EMISSIONS ACCOUNTING IN REPORTING, RISK MANAGEMENT, AND FINANCIAL DECISION-MAKING

Measuring financed emissions is essential for financial institutions seeking to enhance the accuracy and consistency of their emissions reporting. Transparent measurement and disclosures provide valuable insights into the emissions associated with lending and investment activities, enabling institutions and stakeholders to better understand portfolio exposure and improve data-driven decision-making.

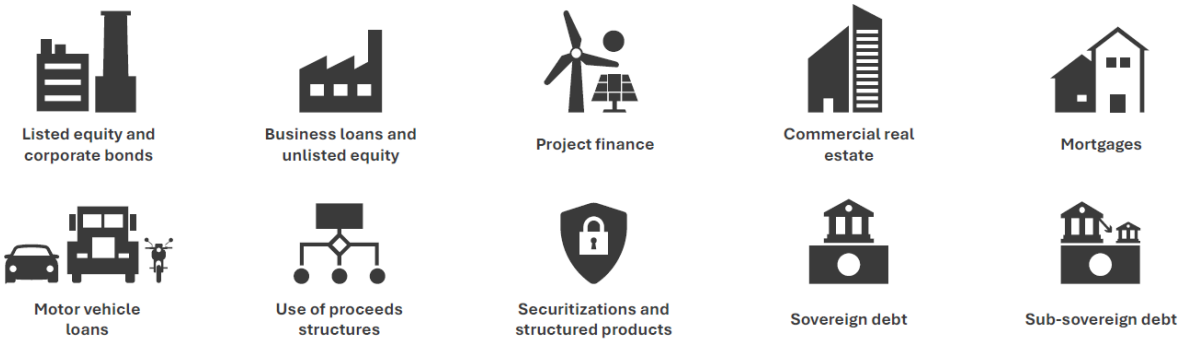
Financed emissions data provide valuable insights for identifying and managing emissions-related financial risks and opportunities. For example, this data can be used to assess the resilience of portfolios under various policy or market scenarios that can influence the financial performance of certain sectors or activities. This understanding supports the development of robust risk management strategies and helps institutions identify areas for innovation and operational improvement. Financial institutions use this data to evaluate progress toward internal objectives and to strengthen transparency in reporting to stakeholders.

STANDARDIZING GHG ACCOUNTING FOR FINANCIAL INSTITUTIONS

This document is the third edition of the Global GHG Accounting and Reporting Standard for the Financial Industry (the "Financed Emission Standard"). Its purpose is to provide financial institutions with transparent, harmonized methodologies to measure and report the emissions they finance through loans and investments, in conformance with the requirements of the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

The PCAF Standard is governed by the PCAF Global Core Team, whose goal is to harmonize GHG accounting and reporting. The Core Team comprises a diverse group representing all regions and types of PCAF signatories, reflecting PCAF's global reach.

The first PCAF Global Core Team began its work in October 2019 by selecting a set of asset classes typical for financial institutions globally, including listed equity and corporate bonds, business loans and unlisted equity, project finance, mortgages, and motor vehicle loans. These asset classes formed the basis of the first edition of the Standard. In 2021, the second Core Team expanded the asset classes covered by the Standard to include sovereign debt and guidance on emission removals. In 2024, the current Core Team continued by developing additional asset class methods and guidance, now included in this Standard. As the Financed Emissions Standard and PCAF evolve, additional asset classes will be added. The third version of the Financed Emissions Standard covers the following asset classes:



Asset class definitions are provided in Chapter 5; Figure 5-1 illustrates how to select the appropriate methodology.

PCAF developed these new methods through robust stakeholder engagement and feedback. From February 2024 through November 2025, PCAF engaged with multiple stakeholders to consider their ideas, discuss PCAF methodological approaches, and gather input. A public consultation on the new methods was held from December 2024 through February 2025 with financial institutions, policymakers, data providers, consultants, and non-governmental organizations (NGOs).

All methodologies build on the GHG Protocol Standards for corporate reporting such as the GHG Protocol Corporate Accounting and Reporting Standard[4], the Corporate Value Chain (Scope 3)[5] Accounting and Reporting Standard, and the supplemental Technical Guidance for Calculating Scope 3 Emissions[6]. Specifically, this Financed Emissions Standard supplements the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard[7] by providing additional detailed guidance for each asset class.

The first edition of this Financed Emissions Standard (November 2020) has been reviewed by the GHG Protocol and is in conformance with the requirements set forth in the Corporate Value Chain (Scope 3) Accounting and Reporting Standard, for Category 15 investment activities. As the GHG Protocol has closed its Built on GHG Protocol review service, the additions to the second edition of the Financed Emissions Standard (December 2023), as well as all new methodologies and guidance introduced in the December 2025 version, have not been reviewed by the GHG Protocol.

Beyond reporting the scope 3 category 15 emissions covered by this Financed Emissions Standard, financial institutions abiding by this Financed Emissions Standard shall also measure and report their scope 1 and 2 emissions, as well as any other relevant scope 3 emissions categories in line with the GHG Protocol's Standards as mentioned above.

EXPECTED USERS OF THIS FINANCED EMISSIONS STANDARD

This Financed Emissions Standard is written primarily for financial institutions that wish to measure and disclose the GHG emissions associated with their loans and investments, including but not limited to:

- Commercial banks
- Investment banks
- Development banks
- Asset owners/managers (mutual funds, pension funds, closed-end funds, investment trusts)
- Insurance companies

[4] (WRI and WBCSD, 2011)
[5] (WRI and WBCSD, 2011) and (WRI and WBCSD, 2013)
[6] (WRI and WBCSD, 2011)

HOW TO READ THIS FINANCED EMISSIONS STANDARD

The Global GHG Accounting and Reporting Standard uses precise language to indicate which provisions are requirements, which are recommendations, and which are allowable options that financial institutions may choose to follow. The following terms are used throughout this Financed Emissions Standard:

- "**Shall**" or "**required**": indicates what is required for a GHG inventory to conform with this Financed Emissions Standard
- "**Should**": indicates a recommendation but not a requirement
- "**May**": indicates an allowed option
- "**Needs**," **"can,"** and **"cannot"**: may be used to provide guidance on implementing a requirement or to indicate when an action is or is not possible

Figure 1-1. Overview of the Financed Emissions Standard and steps for disclosing financed emissions

The importance of GHG accounting

PCAF®
Partnership for Carbon Accounting Financials

2. The importance of GHG accounting

WHAT IS GREENHOUSE GAS (GHG) ACCOUNTING?

GHG accounting refers to the processes required to consistently measure the amount of GHGs generated, avoided, or removed by an entity, allowing it to track and report these emissions over time. The emissions measured are the seven gases mandated under the Kyoto Protocol and are to be included in national inventories under the United Nations Framework Convention on Climate Change (UNFCCC): carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). For ease of accounting, these gases are usually converted to and expressed as carbon dioxide equivalents (CO_2e).

GHG accounting is commonly used by governments, corporations, and other entities to measure the direct and indirect emissions that occur throughout their value chains due to organizational and business activities. According to the GHG Protocol Corporate Accounting and Reporting Standard,[8] direct emissions are generated by sources owned or controlled by the reporting company. Indirect emissions occur as a consequence of the operations of the reporting company, but are generated by sources owned or controlled by another company.

Direct and indirect emissions are further categorized by scope and distinguished according to the source of the emissions and the activity in an organization's value chain in which the emissions occur. The three scopes defined by the GHG Protocol—scope 1, scope 2, and scope 3—are briefly described below and illustrated in Figure 2-1.

- **Scope 1**: Direct GHG emissions that occur from sources owned or controlled by the reporting company, i.e., emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.
- **Scope 2**: Indirect GHG emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company. Scope 2 emissions physically occur at the facility where the electricity, steam, heating, or cooling is generated.
- **Scope 3**: All other indirect GHG emissions (not included in scope 2) that occur in the value chain of the reporting company. Scope 3 can be broken down into upstream emissions and downstream emissions. **Upstream emissions** include all emissions that occur in the life cycle of a material/product/service up to the point of sale by the producer, such as from the production or extraction of purchased materials. **Downstream emissions** include all emissions that occur as a consequence of the distribution, storage, use, and end-of-life treatment of the organization's products or services.

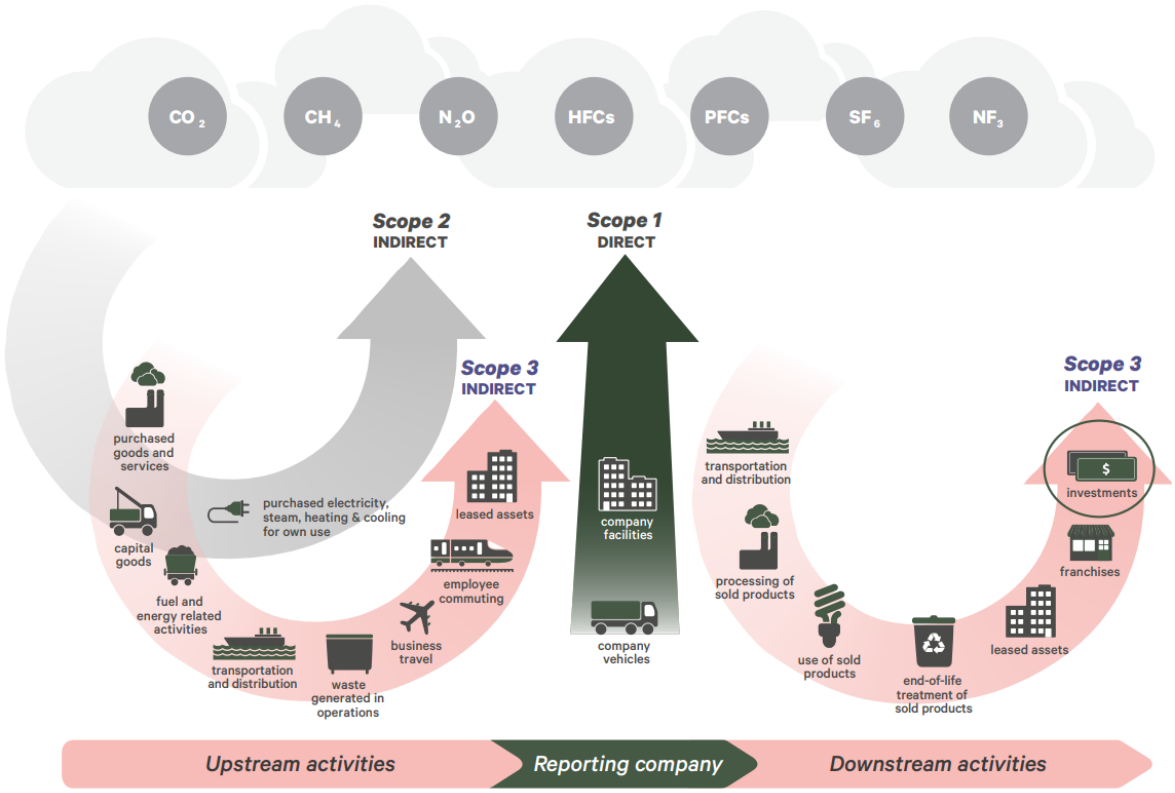
The GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard[9] categorizes scope 3 emissions into 15 categories, listed in Figure 2-1. As the figure shows, the emissions resulting from

[8] (WRI and WBCSD, 2004)
[9] (WRI and WBCSD, 2011)

a reporting company's loans and investments fall under scope 3 downstream emissions, specifically under scope 3 category 15 (investments).

GHG accounting of financial portfolios is the annual accounting and disclosure of scope 3 category 15 emissions at a fixed point in time in line with financial accounting periods.

Figure 2-1. Overview of GHG Protocol scopes and emissions across the value chain



Source: (WRI and WBCSD, 2011)

THE IMPORTANCE OF GHG ACCOUNTING OF LOANS AND INVESTMENTS

For the financial sector, GHG emissions associated with their financial activities represent, by far, the largest share of their overall emissions inventory. For most financial institutions the 'financed emissions' (scope 3, category 15) associated with their loans and investments are the most relevant emissions source. Therefore, understanding these emissions is essential to accurately assess, manage and disclosure climate impacts and exposure to emissions-related risks and opportunities.

The PCAF Global GHG Accounting and Reporting Standard offers a harmonized approach to accounting and disclosure that enables financial institutions to calculate financed emissions in a way that is transparent, consistent, and comparable across time and asset classes. Measuring financed emissions provides critical insights for evaluating portfolio exposure, identifying emissions-intensive sectors, and supporting risk management and disclosure efforts. This information can be integrated into broader

analytical tools, such as scenario analysis or stress testing, to help financial institutions assess how changing markets, policy, or operational conditions may affect their portfolios.

Publicly disclosing this category of emissions helps demonstrate accountability and transparency to stakeholders. Ultimately, consistent GHG accounting enables financial institutions to make informed, data-driven decisions, track performance over time, and strengthen their capacity to respond to evolving market and regulatory expectations.

GHG ACCOUNTING HELPS MEASURE THREE TYPES OF IMPACT: GENERATED EMISSIONS, EMISSION REMOVALS, AND AVOIDED EMISSIONS

GHG accounting for financed emissions is the annual corporate accounting and disclosure of GHG emissions financed by loans and investments in the portfolio of a financial institution at a fixed point in time, in line with financial accounting periods. Financed emissions can be measured as amounts of GHGs generated, avoided, or removed by an institution. The volume of GHG emissions emitted and financed by an institution is commonly referred to as its **generated emissions**[10].

Not all loans and investments result in GHG emissions only. Some may result in mitigating activities. For instance, project-specific loans and investments in the forestry and land use sector, direct air carbon capture and storage, or bioenergy with carbon capture and storage can result in CO_2 being sequestered or removed from the atmosphere and stored in solid or liquid form. Investments in afforestation projects can directly result in newly planted trees absorbing CO_2 from the air. The volume of CO_2 absorbed is considered an **emission removal** that can also be quantified and reported.

Similarly, project-specific loans and investments in renewable energy projects can result in emissions being avoided as they displace the emissions that would have otherwise occurred without the project's implementation. These emissions are referred to as **avoided emissions**. For the financial sector, which finances projects that lead to avoided emissions, quantifying this effect is relevant.

Methods for calculating financed avoided emissions are excluded from this standard. However, financial institutions interested in reporting financed avoided emissions more information is provided in PCAF's supplemental guidance on Financed Avoided Emissions and Forward-looking Metrics.[11]

Reporting on emission removals and avoided emissions **shall** always be done separately from that of the financial institution's scope 1, 2, and 3 GHG inventories.

GHG ACCOUNTING ENABLES BENCHMARKING

Measuring financed emissions in absolute terms provides financial institutions with a consistent baseline for analysis and disclosure. In addition to absolute figures, normalized data are often valuable for

[10] The GHG Protocol often refers to generated emissions as absolute emissions. In this Financed Emissions Standard, where the term "absolute emissions" is used, it is referring to generated emissions and not values relating to avoided emissions or emission removals.
[11] Learn more about PCAF's Financed Avoided Emissions and Forward-looking Metrics supplemental guidance https://carbonaccountingfinancials.com/standard

comparing performance across portfolios, sectors, or asset classes. Normalizing the data involves converting absolute financed emissions into an emission intensity metric (emissions per defined unit of activity or financial exposure). Different intensity metrics can be applied depending on the analytical purpose, as each offers distinct insights into portfolio composition and emissions exposure. Table 2-1 outlines several of the most commonly used emission intensity metrics within the financial sector.

All the intensity metrics shown in Table 2-1 can be useful for steering. As the table shows, economic emission intensity is the absolute emissions of a loan or investment divided by the loan and investment volume in EUR or USD, expressed as tCO_2e/€M or tCO_2e/$M loaned or invested. This metric is valuable for comparing portfolios or portfolio segments. Physical emission intensity is the absolute emissions of a loan or investment divided by a value of physical activity or output, expressed as, e.g., tCO_2e/MWh generated or consumed, or tCO_2e/tonne product produced. It can be used to compare emissions efficiency across companies or sectors using comparable operational metrics. The weighted average carbon intensity (WACI) is expressed as tCO_2e/€M or $M company revenue and can be used to understand a portfolio's exposure to high-emitting sectors or companies.

Table 2-1. Financed emissions metrics[12]

Metric	Purpose	Description
Absolute emissions	To measure the emissions associated with financial activities and establish a baseline for disclosure and performance tracking	The total GHG emissions of an asset class or portfolio
Economic emission intensity	To understand how the emission intensities of different portfolios (or parts of portfolios) compare to each other per monetary unit	Absolute emissions divided by the loan or investment volume in EUR or USD, expressed as tCO_2e/€M or tCO_2e/$M loaned or invested
Physical emission intensity	To understand the efficiency of a portfolio (or parts of a portfolio) in terms of total GHG emissions per unit of a common output	Absolute emissions divided by a value of physical activity or output, expressed as, e.g., tCO_2e/MWh, tCO_2e/tonne product produced
WACI[13]	To understand exposure to emission-intensive companies	Portfolio's exposure to emission-intensive companies, expressed as tCO_2e/€M or $M company[14] revenue

[12] Adapted from (CRO Forum, 2020)
[13] (TCFD, 2017)
[14] The word company refers to the financial institution's borrower or investee.

Supporting goals through GHG accounting

PCAF®
Partnership for Carbon Accounting Financials

3. Supporting goals through GHG accounting

This Financed Emissions Standard aims to equip financial institutions with standardized, robust methods to measure and disclose financed emissions. Building on this foundation, financial institutions can apply greenhouse gas (GHG) accounting to support a range of business objectives, including improving data transparency, enhancing risk management, strengthening stakeholder confidence, and informing strategic planning (Figure 3-1). Financial institutions highlight these business goals as key reasons for assessing financed emissions, but this list is by no means exhaustive. This chapter will elaborate on these goals.

Figure 3-1. GHG accounting can help financial institutions meet multiple business goals

The level of detail in financed emissions calculations determines how effectively financial institutions can use the results to support their business goals. For example, if a financial institution wishes to use the inventory to manage risk, it may consider measuring and recording sector-level emissions from its borrowers or investees to identify emission-intensive industry investments in its portfolios. Other financial institutions may want to structure their inventory in a way that helps them set and track their yearly financed emissions goals. In the end, what is captured in the GHG inventory should serve the business goals of the financial institution.

BUSINESS GOAL 1: CREATE TRANSPARENCY FOR STAKEHOLDERS

Financial institutions increasingly recognize the importance of transparency and accountability in reporting emissions associated with their financial activities. GHG accounting enables financial institutions to produce consistent, verifiable data that can be shared with investors, regulators, and other stakeholders.

The International Sustainability Standards Board (ISSB) provides the global baseline for climate-related disclosures through its International Financial Reporting Standards (IFRS) S2 Standard, which builds upon the former Task Force on Climate-related Financial Disclosures (TCFD) recommendations. These standards emphasize consistency, comparability, and integration of sustainability information into financial reporting. CDP has aligned its financial sector disclosure questionnaires with the ISSB framework by incorporating financed emissions (scope 3, category 15), improving the completeness and reliability of data reported by financial institutions. It has also updated its Financial Services questionnaire to reflect the

PCAF Financed Emissions Standard, integrating PCAF's methodologies to streamline reporting and enhance data quality and consistency.

Within an organization, financed emissions data provides leadership and management teams with valuable insight into portfolio exposure and trends. This information can guide decision-making related to business strategy, product innovation, and long-term planning. Externally, transparent disclosure reinforces trust among clients, investors, and regulators by demonstrating a commitment to credible measurement and responsible reporting.

The Global GHG Accounting and Reporting Standard directly supports financial institutions in responding to CDP disclosure requests by providing clear methodologies and calculation guidance. CDP cites PCAF as a key reference standard for measuring and reporting financed emissions, ensuring consistency and comparability across institutions. This collaboration between PCAF and CDP strengthens the quality and transparency of emissions data, supporting improved reporting practices and greater confidence among market participants.

BUSINESS GOAL 2: MANAGE EMISSIONS-RELATED FINANCIAL RISKS

Financial institutions increasingly recognize the importance of understanding how emissions-related policies, regulations, and market developments affect their portfolios. GHG accounting provides a consistent and quantitative way to identify lending and investment exposures associated with higher-emitting assets or sectors.

Such exposures can be sensitive to evolving regulations, shifts in market preferences, or changes in operational costs — for example, those arising from emissions pricing or energy-efficiency standards. By quantifying financed emissions, institutions gain a clearer picture of where potential financial risks may arise and can integrate this information into their broader risk management and portfolio analysis frameworks.

The International Sustainability Standards Board (ISSB), through its IFRS S2 Standard, emphasizes the importance of disclosing exposure to emissions-related risks as part of transparent financial reporting. Applying the methodologies outlined in the Global GHG Accounting and Reporting Standard supports this expectation by producing standardized, comparable data that enhances the quality of disclosures. In addition to improving external reporting, measuring and managing emissions-related exposure helps institutions strengthen internal governance, prepare for potential regulatory developments, and align with market expectations for transparency and accountability.

BUSINESS GOAL 3: DEVELOP DATA-INFORMED FINANCIAL PRODUCTS

Emissions accounting can also support the development of innovative financial products and services that respond to emerging client and market needs. By integrating financed emissions data into product design, institutions can better understand emissions exposure across sectors and create offerings that reflect evolving regulatory, operational, and risk-management expectations. For example, emissions-related data and intensity metrics, such as those described in Table 2-1, can help identify sectors or companies with

significant potential for operational efficiency improvements or technology modernization. This insight enables institutions to design financial products that align with their clients' objectives for efficiency, resilience, and long-term value creation.

As the market for disclosure and reporting matures, financial products such as sustainability-linked instruments, performance-based loans, and thematic bonds are evolving to incorporate more measurable indicators. Financed emissions data provide the foundation for setting transparent, verifiable criteria within such products, ensuring consistency and comparability across financial institutions.

Ultimately, GHG accounting supports innovation by equipping financial institutions with reliable data to inform product development, improve risk assessment, and enhance the overall quality and credibility of financial decision-making.

BUSINESS GOAL 4: TRACK PROGRESS TOWARD INSTITUTIONAL GOALS

Financial institutions use GHG accounting to establish consistent baselines, track progress over time, and evaluate performance against objectives. By measuring financed emissions across asset classes and sectors, institutions gain a clear understanding of the absolute and relative emissions associated with their lending and investment portfolios. This data can be used to support portfolio analysis, develop measurable performance indicators, and monitor changes in emissions exposure year over year. A standardized accounting approach ensures that results are transparent, comparable, and reliable across reporting periods and institutions.

The Global GHG Accounting and Reporting Standard provides the foundation for this process by offering harmonized methods that can be applied consistently across financial products and asset classes. This enables financial institutions to integrate emissions data into portfolio management, disclosure, and internal target-setting frameworks, in alignment with broader reporting standards such as the International Sustainability Standards Board (ISSB) IFRS S2[15] requirements.

Measuring and disclosing financed emissions also supports more informed engagement with clients and stakeholders, as it provides quantitative insights that can guide portfolio strategy, product design, and performance evaluation. Over time, consistent use of GHG accounting methodologies enhances an institution's ability to assess progress toward its strategic and operational goals and to communicate results transparently.

ACCOUNTING FOR AVOIDED EMISSIONS AND EMISSION REMOVALS

In addition to measuring generated (or financed) emissions, comprehensive GHG accounting also considers how financial activities may contribute to the reduction or removal of greenhouse gases from the atmosphere. Including information on avoided emissions and emission removals helps financial institutions present a more complete picture of the emissions associated with their portfolios. This

[15] (International Sustainability Standards Board (ISSB), IFRS S2 Climate-related Disclosures, 2023)

approach strengthens data integrity, enhances comparability across asset classes, and supports transparent disclosure of both positive and negative emissions impacts.

Understanding the difference between avoided emissions and emission removals is essential to this process. Both represent valuable accounting categories that complement financed-emissions data and allow financial institutions to better evaluate their exposure, opportunities, and performance over time.

The distinction between avoided emissions and emission removals is important from an accounting perspective. The differences are illustrated in the figure below:

Figure 3-2: Avoided emissions and emission removals

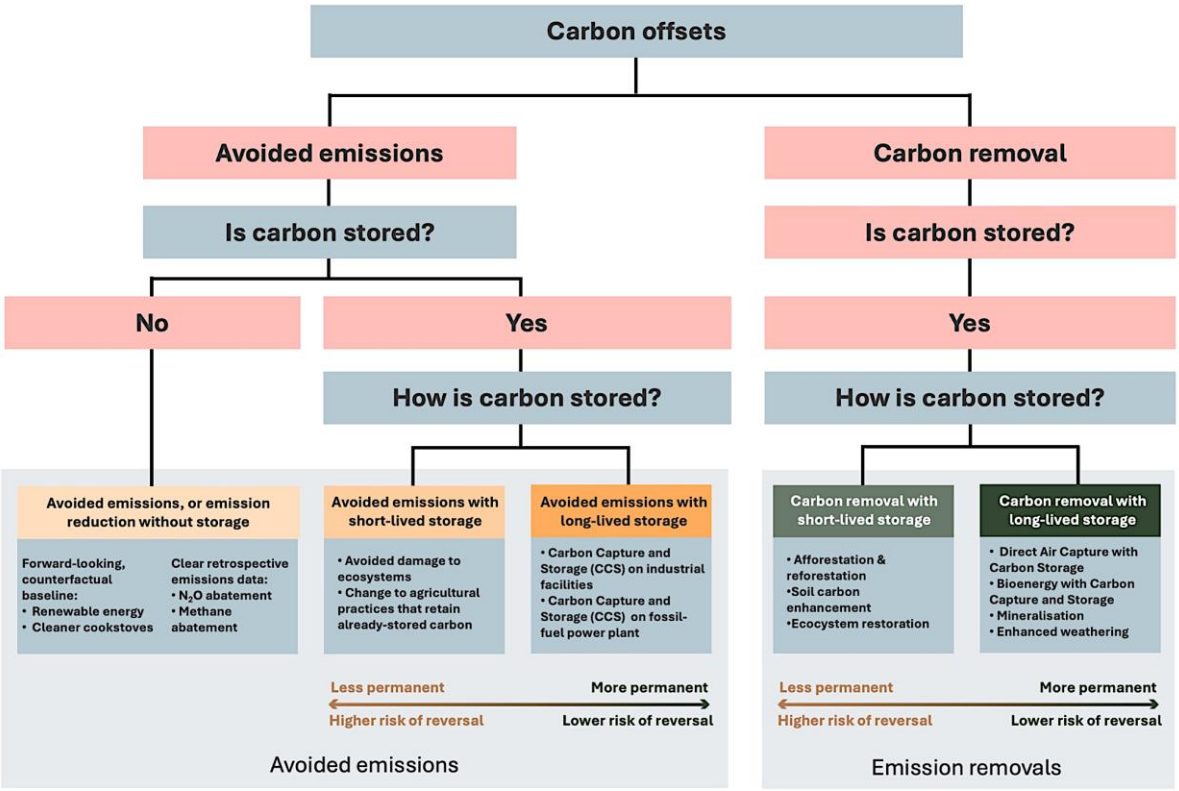


Figure adapted from the Oxford Offsetting Principles.[16]

For transparency and consistency, avoided emissions and emission removals **shall** be measured and reported separately from a financial institution's scope 1, 2, and 3 GHG inventories. Quantifying these categories allows for a clearer understanding of financed activities that reduce or remove emissions within the broader economy.

- Financial institutions can finance emission removals via three ways:

[16] Oxford offsetting principles, accessed at https://www.smithschool.ox.ac.uk/research/oxford-offsetting-principles

- **Credit purchases:** FIs can buy and retire carbon removal credits[17] based in the voluntary carbon market. Because these purchases are not part of their lending or investment portfolio, these credits are not incorporated into the PCAF Financed Emissions Standard. For more information, FIs should refer to the GHG Protocol on how to include carbon credits in their accounting.[18]
- **Business Loans and Unlisted Equity**: FIs can lend to or invest in companies such as forestry companies that have emission removals within their organizational boundaries. They can also lend to or invest in companies that purchase and retire carbon removal credits. For more information on the financed emissions accounting of these lending and investment activities, see the methodology chapter on Listed Equity & Corporate Bonds and the methodology chapter on Business Loans & Unlisted Equity.
- **Project Finance**: FIs can lend to or invest in nature-based or technological projects that remove emissions from the atmosphere. They can also lend to, or invest in, projects that purchase and retire carbon removal credits. For more information on the financed emissions accounting of these lending and investment activities, see the methodology chapter on Project Finance.

PCAF guidance on carbon removals is limited to attribution and reporting guidance for financial institutions. For specific accounting guidance on calculating and reporting emissions removals, PCAF refers to the forthcoming Land Sector and Removals Guidance from the GHG Protocol[20].

Refer to PCAF's supplemental guidance on financed avoided emissions and forward-looking metrics for detailed information on estimating financed avoided emissions. This optional guidance supplements Part A, offering financial institutions a structured approach to estimate and disclose potential future climate benefits.

[17] Reporting around the use of carbon credits may need to evolve because it does not yet consistently distinguish between avoidance and removal credits.
[18] Note that GHG Protocol's 'Land Sector and Removals Guidance' is currently being developed through a multi-stakeholder development process. The draft guidance is published for both pilot testing and review in June 2022. Final publication is expected in Q4 2025. https://ghgprotocol.org/land-sector-and-removals-guidance.

Principles and requirements for GHG accounting for financials

PCAF®
Partnership for Carbon Accounting Financials

4. Principles and requirements for GHG accounting for financials

To develop this Financed Emissions Standard, PCAF drew on the GHG accounting principles outlined in the GHG Protocol Corporate Accounting and Reporting Standard[19]and the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.[20] Based on these principles, PCAF developed an additional set of five overarching rules to guide accounting and reporting for financial institutions.

4.1 GHG accounting requirements derived from the GHG Protocol's principles

Like financial accounting and reporting, GHG accounting and reporting follows generally accepted principles to ensure that an organization's disclosure represents an accurate, veritable, and fair account of its GHG emissions. The core principles of GHG accounting are set out in the GHG Protocol Corporate Accounting and Reporting Standard[21] and the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.[22] The GHG Protocol's five core principles are completeness, consistency, relevance, accuracy, and transparency. The Global GHG Accounting and Reporting Standard for the Financial Industry follows these five core principles and provides additional requirements on the application of these principles that are directly relevant for financial institutions wishing to assess their financed emissions (Figure 4-1).

[19] (WRI and WBCSD, 2004)
[20] (WRI and WBCSD, 2011)
[21] (WRI and WBCSD, 2004)
[22] (WRI and WBCSD, 2011)

Figure 4-1. Additional PCAF requirements for financed emissions accounting and reporting are derived from the GHG Protocol's five principles

GHG Protocol principles for scope 3 inventories	Additional PCAF requirements
Completeness Account for and report on all GHG emission sources and activities within the inventory boundary. Disclose and justify any specific exclusions. **Consistency** Use consistent methodologies to allow for meaningful performance tracking of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series. **Relevance** Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users — both internal and external to the company. **Accuracy** Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable confidence as to the integrity of the reported information. **Transparency** Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.	**Recognition** Financial institutions shall account for all financed emissions under scope 3 category 15 (Investment) emissions, as defined by the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard. Any exclusions shall be disclosed and justified. **Measurement** Financial institutions shall measure and report their financed emissions for each asset class by "following the money" and using the PCAF methodologies. As a minimum, absolute emissions shall be measured. However, avoided and removed emissions may be measured if data is available and methodologies allow. **Attribution** The financial institution's share of emissions shall be proportional to the share of its exposure relative to the total (company, project, asset) value of the borrower or investee. **Data quality** Financial institutions shall use the highest quality data available for each asset class and improve the quality of the data over time. **Disclosure** Public disclosure of the results of PCAF assessments is crucial for external stakeholders and financial institutions using the methodology to have a clear, comparable view of the GHG emissions associated with the loans and investments of financial institutions.

4.2 Additional requirements for accounting and reporting financed emissions

This subchapter describes the additional requirements for GHG accounting for financials and how these requirements guide the accounting and reporting of financed emissions regardless of the type of loan and investment. Chapter 6 includes additional details on reporting requirements and recommendations.

RECOGNITION

According to the GHG Protocol Corporate Accounting and Reporting Standard,[23] organizations can choose from three approaches when defining their organizational boundaries and consolidating the GHG emissions measured and reported in their inventories:

- Equity share approach
- Financial control approach
- Operational control approach

The selection of one of these approaches affects which activities in the company's value chain are categorized as direct emissions (i.e., scope 1 emissions) and indirect emissions (i.e., scope 2 and scope 3 emissions).[24]

For consistency in reporting across organizations and reporting periods, this Financed Emissions Standard requires financial institutions to measure and report their GHG emissions using either the operational or financial control approach. As explained in Box 4-1, this means that emissions from financial institutions' loans and investments (without operational or financial control[25]) will be reported under their scope 3 category 15 (investments) emissions, as defined by the GHG Protocol Value Chain (Scope 3) Accounting and Reporting Standard.[26] This requirement eliminates inconsistencies in accounting that could arise from using the equity share approach, which would require scope 1 and 2 emissions from all equity investments to be reported under the financial institution's scope 1 and 2 emissions (according to its share of equity in the operation).

As a result, the Financed Emissions Standard provides a harmonized approach that can be used by financial institutions wishing to account for and disclose their scope 3 category 15 (investments) emissions (otherwise known as their financed emissions), and these are the sole focus of this Financed Emissions Standard. Financial institutions following the Financed Emissions Standard are required to report all financed emissions under scope 3 category 15 and disclose and justify any exclusions.

[23] (WRI and WBCSD, 2004)
[24] (WRI and WBCSD, 2004)
[25] Only in cases that a financial institution has control (operational or financial, depending on the approach chosen) over the operations of the borrower, or investee will 100% of their emissions be included within the organizational boundaries of the financial institution. As a result, these emissions will be included under the scope 1 and 2 emissions of the financial institution. This can occur when a financial institution holds a controlling equity share in the investee. In general, however, most of the financial sector's loans and investments are not held to gain control over their borrower or investee.
[26] (WRI and WBCSD, 2004)

Beyond reporting the scope 3 category 15 emissions covered by this Financed Emissions Standard, financial institutions shall also measure and report their own scope 1 and 2 emissions and any other relevant scope 3 emissions categories in line with the GHG Protocol's standards.

Box 4-1 details consolidation approaches as applied to the financial sector.

Box 4-1. Why the Global GHG Accounting and Reporting Standard requires financial institutions to measure and report financed emissions using the operational or financial control approach

The GHG Protocol Corporate Accounting and Reporting Standard[27] presents three consolidation approaches when preparing GHG emission inventories: the equity share approach, the financial control approach, and the operational control approach. These consolidation approaches are intended to define the organizational boundaries of the company for the purposes of accounting and reporting GHG emissions. The selection of one of these approaches affects which activities in the company's value chain are categorized as direct emissions (i.e., scope 1 emissions) and indirect emissions (i.e., scope 2 and scope 3 emissions).

Under the **equity share approach**, an organization accounts for GHG emissions from operations according to its share of equity—or ownership—in the operation. So, holding a 15% equity share in another organization would require including 15% of its emissions across all its emission scopes: scope 1, 2, and 3.

Alternatively, an organization can report using the **control approach**, whereby the company reports 100% of the GHG emissions over which it has control as if these emissions were its own (i.e., 100% of direct emissions are reported under scope 1 and 100% of indirect emissions are reported under scope 2 or 3, respectively). Where the company owns an interest but does not have control, it does not account for GHG emissions from operations as part of its scope 1 and 2 emissions. However, emissions from such operations will be reported under scope 3 emissions according to its relative share of ownership.[28]

A control approach can be subclassified as either financial control or operational control, and companies using the control approach must pick between these two options for reporting. Using the **financial control approach**, the organization shall report 100% of emissions for all activities in the company where it can directly influence financial and operational policies and has the potential to benefit economically from the company's activities. Using the **operational control approach**, an organization shall account for 100% of emissions from operations over which it or one of its subsidiaries has control and the authority to introduce and implement operational policies. In most cases, whether an operation is controlled by the company or not does not differ between the financial control or operational control approach.

The consolidation approach used by a financial institution has a significant impact on how it accounts for its financed emissions. Choosing the equity share approach would require scope 1 and 2 emissions from

[27] (WRI and WBCSD, 2004)
[28] In practice, using a control approach means that when a company has control over an operation 100% of the scope 1 and 2 emissions of this operation are also reported under the companies' scope 1 and 2 footprint.

all equity investments to be reported under the financial institution's scope 1 and 2 emissions (according to its share of equity in the operation), whereas financed emissions from other asset classes would end up in scope 3.

However, when choosing a control approach, only emissions from those operations where the financial institution, through its investments, holds a controlling interest would end up in its scope 1 and 2 emissions. In all other cases financed emissions end up in scope 3 category 15. As financial institutions' investments in equity or debt are typically not intended to hold a controlling interest, this Financed Emissions Standard requires financial institutions to measure and report their GHG emissions using either the operational or financial control approach. This requirement allows for consistent reporting of financed emissions in scope 3 emission category 15.

MEASUREMENT

"Follow the money" is a key tenet for GHG accounting of financial assets, meaning that the money should be followed as far as possible to understand and account for the emission impact in the real economy, i.e., emissions caused by the financial institution's loans and investments.

Financial institutions shall measure and report their financed emissions for each asset class using the methodologies set out in this Financed Emissions Standard and covering the seven GHGs required under the Kyoto Protocol. As a minimum, financial institutions shall measure the absolute GHG emissions resulting from loans and investments (scope 3 category 15 emissions) in the reporting year. When relevant, emission removals should be measured and reported separately.

As a basis for reporting emissions, financial institutions shall choose a fixed point in time to determine their lending and investment positions, such as the last day of its fiscal year (e.g., June 30 or December 31), to calculate an attribution factor. The GHG accounting period shall align with the financial accounting period.

ATTRIBUTION

According to the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, GHG emissions from loans and investments should be allocated to the reporting financial institutions based on the proportional share of lending or investment in the borrower or investee.[29] Attribution is based on the annual emissions of the borrower and investee; as a result, GHG emissions are reported on at least an annual basis.

The methodologies in the Financed Emissions Standard apply the same general attribution principles across all asset classes (Figure 4-2):

1. Financed emissions are always calculated by multiplying an attribution factor (specific to that asset class) by the emissions of the borrower or investee.
2. The attribution factor is defined as the share of total annual GHG emissions of the borrower or investee that is allocated to the loan(s) or investment(s).

[29] (WRI and WBCSD, 2011)

3. The attribution factor is calculated by determining the share of the outstanding amount of loans and investments of a financial institution over the total value of the company, project, or asset to which the financial institution has lent money or in which it has invested capital. The value of the investee can be the total equity and debt or EVIC of the company, project, etc. to which the financial institution has lent money or in which it has invested capital.

Including both equity and debt funding in the denominator when attributing emissions associated with corporate finance[30], is important for three reasons:

1. It ensures the use of one common denominator across all asset classes, which is in line with leading practices in the financial sector.
2. It does not differentiate between equity and debt. Both contribute to the total financing of the borrower or investee (and indirectly their emissions) and are therefore deemed equally important.
3. It ensures 100% attribution of emissions over equity and debt providers and avoids double counting of emissions between equity and debt providers as much as possible. This is specifically important for financial institutions that hold both equity and debt positions within the same companies or projects.

Figure 4-2. The general approach to calculate financed emissions from corporate financed

$$\text{Financed emissions} = \sum_i \text{Attribution factor}_i \times \text{Emissions}_i$$

(with i = borrower or investee)

$$\text{Attribution factor}_i \rightarrow \frac{\text{Outstanding amount}_i}{\text{Total equity + debt}_i}$$

Double counting, which occurs when GHG emissions are counted more than once in the financed emissions calculation of one or more institutions, should be minimized as much as possible. Double counting occurs between the different scopes of emissions from loans and investments when a financial institution lends to or invests in companies or projects in the same value chain.[31] This form of double counting cannot be avoided, but it can be made more transparent by reporting the scope 1 and 2, emissions of loans and investments separately from their scope 3 emissions (see requirements on this in Chapter 6 of this Financed Emissions Standard).

Double counting can take place at five levels:

- Between financial institutions
- In co-financing the same entity or activity
- Between transactions within the same financial institutions
- Across different asset classes

[30] When calculating the attribution factor for consumer vehicle and public finance (i.e. Sovereign debt), equity may not be relevant or exist based on investment type. For those asset classes, the best alternative approach has been proposed in the relevant chapter.
[31] The scope 1 emissions of one company can be the upstream scope 2 or 3 emissions of its customer. For example, scope 1 emissions from a utility providing energy to a company would end up in the scope 2 inventory of that company. If both companies are receiving funding from the same financial institution, these emissions would be double counted within its inventory.

- Within the same asset class

Double counting between co-financing institutions and between transactions within the same asset class of a financial institution can be avoided by using the appropriate attribution rules consistently. PCAF defines attribution rules for each method described in this Financed Emissions Standard. By using the correct attribution method, double counting of emissions between financial institutions can be minimized. Additional asset class-specific information on attribution can be found in Chapter 5.

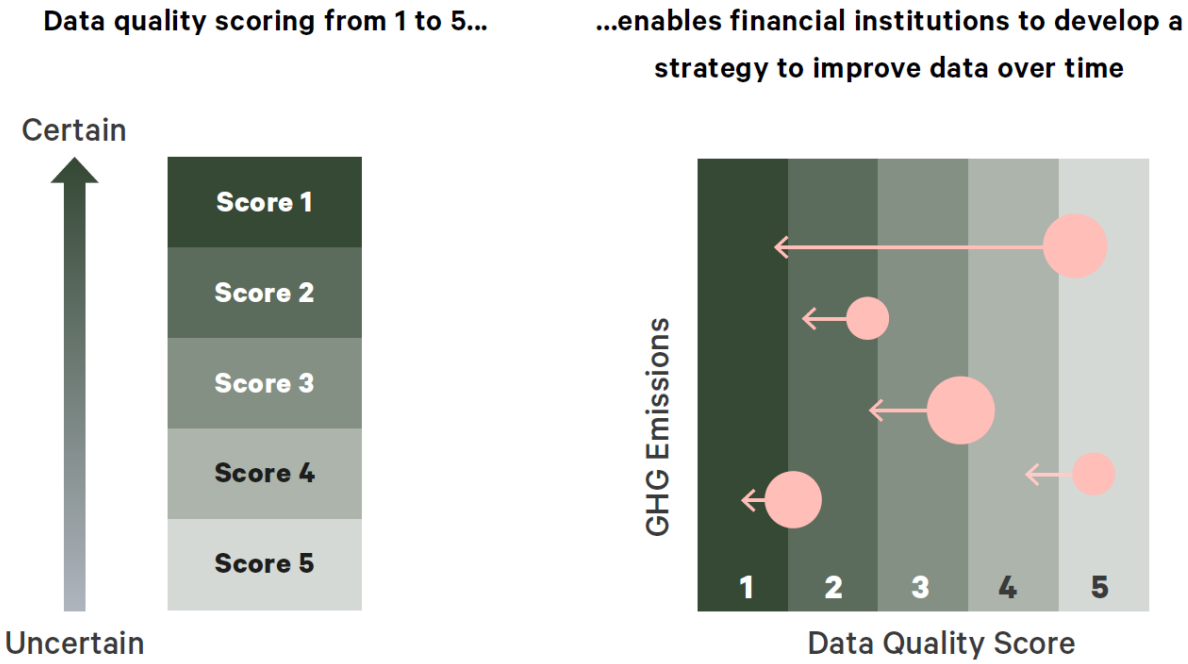
DATA QUALITY

Financial institutions shall ensure that their GHG accounting appropriately reflects the GHG emissions of their loans and investments and serves the decision-making needs of internal and external stakeholders. To safeguard these outcomes, financial institutions should use the highest quality data available for each asset class for calculations and, where relevant, improve the quality of the data over time. PCAF recognizes that high-quality data can be difficult to come by when calculating financed emissions, particularly for certain asset classes. However, data limitations should not deter financial institutions from taking the first steps toward preparing their inventories. Even estimated or proxy data can help them identify emission-intensive hotspots in their portfolios, which can inform their climate strategies. Where data quality is low, financial institutions can develop approaches to improve it over time.

For measuring financed emissions in each asset class, various data inputs are needed to calculate the financial institution's attribution factor and the borrower's or investee's total emissions. The data needed to calculate an attribution factor can typically come from the financial institution itself and its borrower or investee. However, the data required to calculate the emissions of the borrower or investee might not be readily available and must be sought out by the financial institution. The quality of this data can vary depending on assumptions relating to its assuredness, specificity, and other variables.

High-quality data is often not available to the financial institution for all asset classes. In these instances, the institution should use the best available data per the data hierarchy shown in Figure 4-3. Data quality scorecards specific to each asset class are presented in Chapter 5 and Annex 10.1.

Figure 4-3. General data quality scorecard



PCAF recognizes that there is often a lag between financial reporting and the reporting of required emissions-related data for the borrower or investee. In these instances, financial institutions should use the most recent data available even if it is representative of different years, with the intention of aligning as much as possible. For example, it would be expected and appropriate that a financial institution's reporting in 2020 for its 2019 financial year would be used in 2019 financial data alongside 2018 (or other most recent) emissions data.

Data quality scoring is specific to each asset class. More information on issues related to data quality and how to employ the hierarchy for each asset class can be found in Chapter 5 and Annex 10.1.

DISCLOSURE

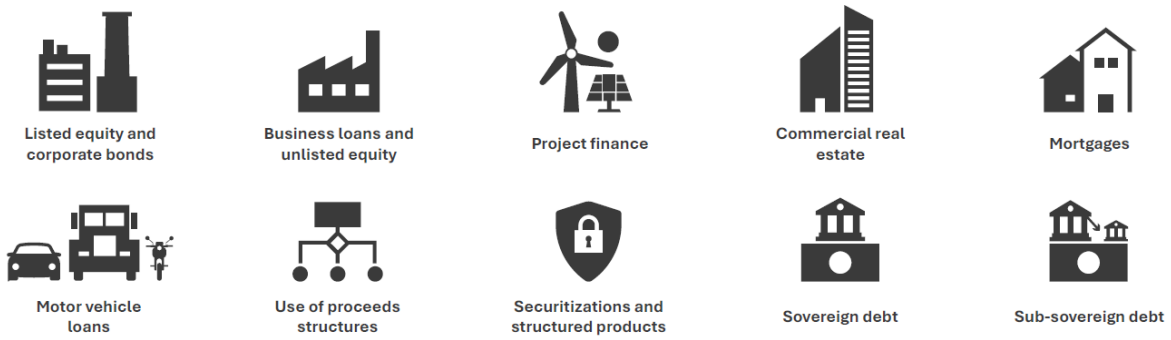
The public disclosure of absolute financed emissions is crucial for external stakeholders and financial institutions using the methodology to have an analogous view of the emission impact of financial institutions. To this end, financial institutions shall disclose absolute financed emissions. To support their disclosures, financial institutions shall follow the requirements and recommendations listed in Chapter 6 on how to report information relating to methodology, calculations, timeframes, and data quality (as scored using the hierarchies provided in Chapter 5).

Methodology to measure financed emissions

PCAF®
Partnership for Carbon Accounting Financials

5. Methodology to measure financed emissions

This chapter describes the methods to calculate financed emissions for ten asset classes.



Each asset class has its own section covering methodological guidance on the following elements:[32]

- Asset class definition
- Emission scopes covered
- Attribution of emissions
- Equations to calculate financed emissions
- Data required
- Other considerations
- Limitations

Guidance for calculating absolute emissions is covered in each asset class method. Methods for calculating emission removals are provided in three asset classes: listed equity and corporate bonds, business loans and unlisted equity, and project finance.[33] Methods for calculating financed avoided emissions are excluded from this standard. However, for financial institutions interested in reporting financed avoided emissions more information is provided in PCAF's supplemental guidance on Financed avoided emissions and forward-looking metrics[34].

The asset classes covered by this PCAF Standard represent a majority of the portfolio of most financial institutions. PCAF recognizes that some financial products may not be covered. PCAF intends to continue to complement its Standard in the future, based on guidance from PCAF signatories, users and other standards and frameworks. Developing an accurate, comparable, feasible, and broad-based standard covering numerous asset classes will be an iterative process.

[32] These are the core elements in each asset class method. Some chapters include additional information, where relevant and specific to the asset class.
[33] Definitions of absolute emissions avoided emissions, and emission removals can be found in Chapter 2 and in the glossary (Chapter 7).
[34] Learn more about PCAF's Financed avoided emissions and forward-looking metrics supplemental guidance https://carbonaccountingfinancials.com/standard

HOW TO CHOOSE THE RIGHT ASSET CLASS METHOD?

How financed emissions are measured depends on the type of financing provided to the borrower and investee and what is known about the flow of the money. Financial institutions should use Figure 5-1 and the accompanying guidance to determine the appropriate asset class method.

Figure 5-1. Guidance for choosing an approach to calculate financed emissions

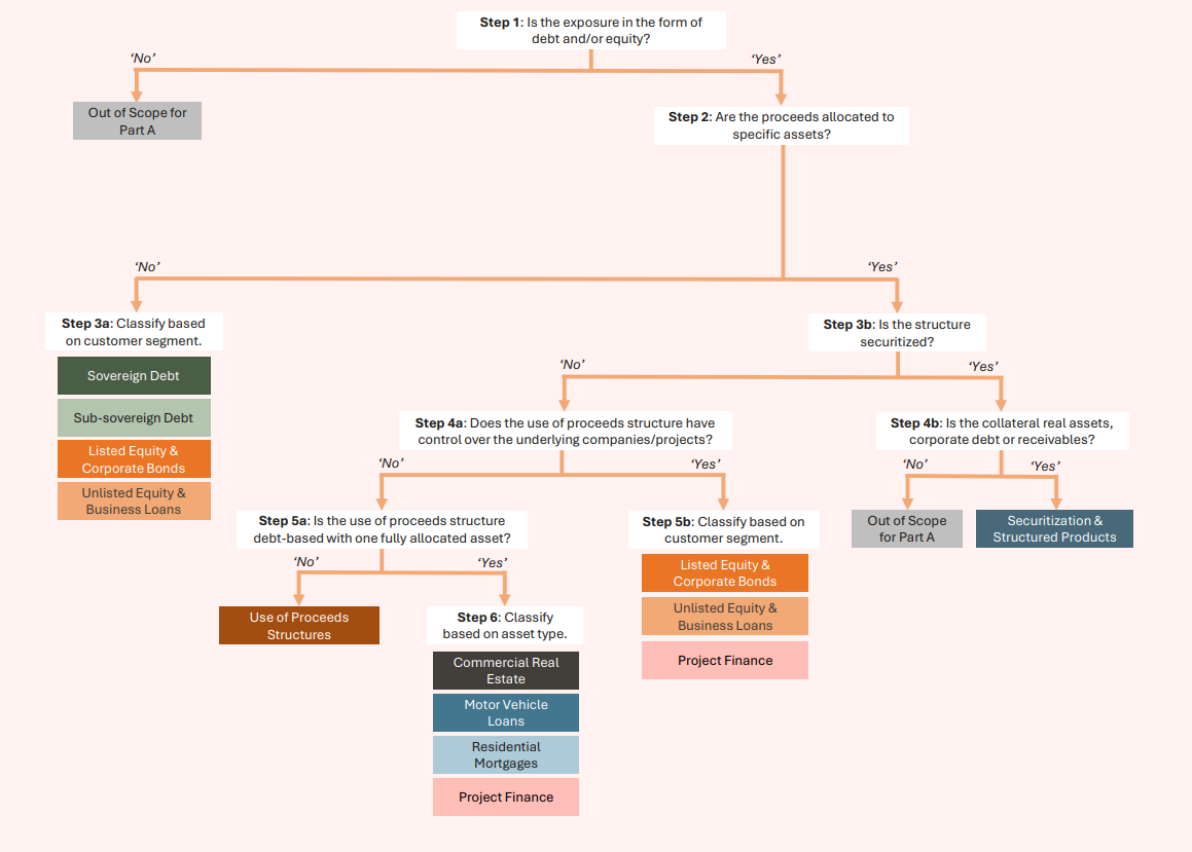


Figure 5-1 is structured as a step-by-step decision tree, where each step poses a Yes/No question. Financial institutions should work through it from top to bottom to arrive at the appropriate asset class method.

As outlined in Chapter 4, "follow the money" is a core principle of GHG accounting of financial assets. Financial institutions should trace financial flows as far as possible to understand and account for the GHG emissions of lending and investments. The guidance below supports interpretation of each question in Figure 5.1 and helps identify the applicable PCAF methodology.

Step 1: Is the exposure debt and/or equity35?

To answer Yes: The exposure represents a financial relationship where the institution provides capital through debt or equity instruments.

To answer No: The exposure does not qualify as a financed asset under Part A — for example, derivatives, underwriting activities, or advisory services that do not create debt or equity exposure. These are out of scope for Part A and may be addressed in Part B (Facilitated Emissions) or Part C (Insurance-Associated Emissions) where applicable.

Step 2: Are the proceeds allocated to specific assets?

To answer Yes: There is clear evidence that proceeds are allocated to one or more specific underlying assets, such as an investment fund, labeled bond, mortgage or project. Proceed to Question 3b.

To answer No: The financing is provided directly to the borrower or investee, with an unknown use of proceeds. Proceed to Step 3a.

Step 3a: Classify based on customer segment.

If the financing is provided directly to a borrower or investee, the financial institution should select the appropriate asset class method based on the customer segment (sovereign debt, sub-sovereign debt, listed equity/corporate bonds, or unlisted equity/business loans).

General consumer finance not linked to a specific use of proceeds (e.g., credit cards or personal loans) is out of scope for Part A.

Step 3b: Is the structure securitized?

To answer Yes: The structure is legally distinct from the issuing entity and issues securities backed by identifiable loans, leases, or receivables (e.g., RMBS, CMBS, CLO, Auto ABS). Move to Question 4b to determine whether the structure is in scope for the Securitizations & Structured Products method.

To answer No: The structure is not a securitization. Proceed to Step 4a,

Step 4a: Does the use of proceeds structure have control over the underlying companies/projects?

To answer Yes: Only use of proceeds structures that provide equity can have control over the underlying assets.[36] In this case the underlying assets are generally consolidated on the balance sheet of the use of proceeds structure. For more detailed information, see section 'GHG accounting treatment' in the Use of Proceeds Structures method (subchapter 5.7). Proceed to Question 5b.

---

[35] Equity is defined as ownership in the company or project. Debt is defined as a financing instrument that requires repayment by the borrower.
[36] Control is used as a combined term here to refer to both the financial control and operational control approaches under the GHG Protocol Corporate Accounting and Reporting Standard.

To answer No: The use of proceeds structure does not control underlying assets (e.g. provides only debt). Proceed to Step 5a.

Step 4b: Is the collateral real assets, corporate debt or receivables?

To answer Yes: The securitization is backed by identifiable real assets (e.g. property), corporate debt (e.g. business loan or corporate bonds), or receivables (e.g. auto loans). Such structures are in scope for the Securitizations & Structured Products method, which follows a "look-through" to the underlying collateral. Move to subchapter 5.8 for a detailed description of what is in scope and the accompanying decision tree for securitizations and structured products.

To answer No: The securitization is not backed by real assets, corporate debt, or specified receivables, but for example, it is backed by credit card or student loan receivables, or home equity loans, or it is a public sector covered bond. A more detailed list is available in subchapter 5.8. Such structures are currently out of scope for Part A.

Step 5a: Is the use of proceeds structure debt-based with one fully allocated asset?

To answer Yes: The structure is debt-based and the financing is tied to a single, clearly identifiable underlying asset (e.g., a specific building, project, or vehicle). In this case, the exposure should be treated under the corresponding asset class methodology rather than as a use of proceeds structure. Proceed to Step 6.

To answer No: The structure is not debt-based or the proceeds are allocated across multiple assets or projects without direct control. The exposure qualifies as a use of proceeds structure, which should be accounted for using the methodology described in subchapter 5.7.

Step 5b: Classify based on customer segment.

If the use of proceeds structure has control over the underlying companies or projects, it should be treated as a corporate-type investment. In this case, the financial institution should apply the appropriate asset class methodology based on the customer segment (listed equity/corporate bonds, unlisted equity/business loans, project finance).

Step 6: Classify based on asset type.

If the financing is linked to a single identifiable underlying asset, the financial institution should select the corresponding asset class method based on the type of asset financed (commercial real estate, residential mortgages, motor vehicle loans, or projects)

Additional guidance on coverage

Each asset class method currently only covers financial products that are on the balance sheet of the financial institution (i.e. the asset owner) at the fiscal year-end, but may also be applied by asset managers managing assets on the asset owner's behalf. This means that financed emissions from products such as revolving credit facilities, bridge loans, and letters of credit are only considered if there is outstanding

finance on the balance sheet of the financial institution at financial year-end. In a similar fashion, assets held for short durations or designated as held for sale are not included in the Financed Emissions Standard. PCAF may cover if and how to treat such financing in future editions of the Standard.

The Financed Emissions Standard only provides guidance on the ten asset classes mentioned above. Table 5-1 defines these asset classes, including information on the financial products being covered by the respective asset class and the location in the document where specific guidance can be found.

The Financed Emissions Standard does not provide explicit guidance on methods to calculate financed emissions for every financial product including the following: exchange traded funds, derivatives (e.g., futures, options, swaps), and more. More detailed guidance on such financial products will be considered and potentially published in later editions of the Financed Emissions Standard.

Table 5-1. List of asset classes

Asset class	Definition	Definition
Listed Equity and Corporate Bonds	This asset class includes all on-balance sheet listed and unlisted corporate bonds and all on-balance sheet listed equity[37] that are traded on a market and are for general corporate purposes, i.e., unknown use of proceeds as defined by the GHG Protocol.	Subchapter 5.1
Business Loans and Unlisted Equity	This asset class comprises business loans and equity investments in private companies, also referred to as unlisted equity. Business loans include all on-balance sheet loans and lines of credit to listed and unlisted businesses, nonprofits, and any other structure of organization[38]and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol. Unlisted equity includes all on-balance sheet equity investments to businesses, nonprofits, and any other structure of organization that are not traded on a market and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol.	Subchapter 5.2
Project Finance	This asset class includes all on-balance sheet loans or equities to projects or activities that are designated for specific purposes, i.e., with known use of proceeds as defined by the GHG Protocol and is self-contained (i.e. the project has its own budget). The financing is designated for a defined activity or set of activities, such as the construction and operation of a gas-fired power plant, a wind or solar project, or energy efficiency projects.	Subchapter 5.3
Commercial Real Estate	This asset class includes on-balance sheet loans for specific corporate purposes, namely the purchase and refinance of commercial real estate (CRE), and on-balance sheet investments in CRE when the financial institution has no operational control over the property. This definition implies that the property is used for commercial purposes, such as retail, hotels, office space, industrial, or large multifamily rentals. In all cases, the owner of the building uses the property to conduct income-generating activities.	Subchapter 5.4
Mortgages	This asset class includes on-balance sheet loans for specific consumer purposes - namely the purchase and refinance of residential property, including individual homes and multi-family housing with a small number of units. This definition implies that the property is used only for residential purposes and not for commercial activities.	Subchapter 5.5

[37] Listed equity refers to equity that is traded on a stock exchange or another securities exchange
[38] This also includes governmental-owned enterprises (e.g., state-owned companies such as municipal energy or public transport providers), while loans to governments themselves are excluded. Loans to governments is covered under Sovereign Debt asset class.

Motor Vehicle Loans	This asset class refers to on-balance sheet loans and lines of credit to businesses and consumers for specific (corporate or consumer) purposes - namely the finance one or several[39] motor vehicles.	Subchapter 5.6
Use of Proceeds Structures	This method includes all on-balance sheet debt and equity to use of proceeds structures. Use of proceeds structures contain a pool of one or multiple underlying assets, which may belong to any asset class. This subchapter introduces guidance to allow financial institutions to account for the specific assets being financed.	Subchapter 5.7
Securitizations and Structured Products	This method covers securitized and structured products which are backed by identifiable loans, leases, or other income-generating assets. Typically, the collateral pool is sold to a bankruptcy-remote special-purpose vehicle (SPV) or similar entity, or referenced and the vehicle issues bonds to investors secured on the collateral. It encompasses both public and private asset-backed structures. The underlying collateral may include various asset types, and an evaluation of these assets must be performed to determine the applicable financed emissions methodology.	Subchapter 5.8
Sovereign Debt	This asset class includes sovereign bonds and sovereign loans of all maturities issued in domestic or foreign currencies. Both sovereign loans and bonds lead to the transfer of funds to the country, which in turn creates a debt obligation to be repaid by the borrowing country.	Subchapter 5.9
Sub-sovereign Debt	This asset class includes bonds and loans issued by public authorities below the national level — such as states, provinces, regions, cities, or municipalities — in either domestic or foreign currency.	Subchapter 5.10

[39] A single loan might cover the purchase of several vehicles or fleets. In any case, the methodology presented in this chapter should be used.

Listed equity and corporate bonds

PCAF®
Partnership for Carbon Accounting Financials

5.1 Listed equity and corporate bonds

ASSET CLASS DEFINITION

This asset class includes all on-balance sheet listed and unlisted corporate bonds and all on-balance sheet listed equity[40] that are traded on a market and are for general corporate purposes (i.e., unknown use of proceeds as defined by the GHG Protocol).

These include:

- All types of corporate bonds for general corporate purposes
- Common stock
- Preferred stock

For indirect investments (e.g., investments in funds) that incorporate listed equity and bonds, the methodological approach is the same provided the information on the individual holdings is available.

Derivative financial products (e.g., futures, options, swaps) are not covered by this asset class. The same holds for short and long positions or special cases of underwriting such as IPO underwriting. Guidance on such financial products may be published in later editions of the Financed Emissions Standard.

Assets held for short durations and designated as held for sale are not in scope. These assets may include, but not be limited to, trading account assets and debt securities carried at fair value.

Equity investments in private companies are not covered by this asset class because that is finance not traded on a market. For more information on equity investments in private companies, please refer to the business loans and unlisted equity asset class.

EMISSION SCOPES COVERED

Financial institutions **shall** report the absolute scope 1, scope 2 and scope 3 emissions of borrowers and investees across all sectors. Financial institutions **shall** separately disclose absolute scope 3 emissions from scope 1 and 2 emissions of borrowers and investees.

Box 5.1-1. PCAF's former phase-in approach to scope 3 emissions reporting for financial institutions

In previous versions of the Global GHG Accounting and Reporting Standard, for reporting the scope 3 emissions of borrowers and investees, PCAF followed a phase-in approach which required scope 3 reporting for lending to and making investments in companies depending on the sector in which they are active, i.e., where they earn revenues. This phase-in approach has been completed, meaning that for reports published in 2025 onwards, scope 3 emissions reporting is required for all sectors.

[40] Listed equity refers to equity that is traded on a stock exchange or another securities exchange.

PCAF acknowledges that, to date, the comparability, coverage, transparency, and reliability of scope 3 data still varies greatly per sector and data source. By requiring scope 3 reporting for all sectors over time, PCAF seeks to make scope 3 emissions reporting more common by improving data availability and quality over time. Financial institutions **shall** explain if they are not able to report the required scope 3 emissions because of data availability or uncertainty.

Table 5.1-1. Previous PCAF phase-in approach for scope 3 emissions inclusion

Phase-in period	NACE Level 2 (L2) sectors considered
For reports published in 2021 onwards	At least energy (oil & gas) and mining (i.e., NACE L2: 05-09, 19, 20)
For reports published in 2023 onwards	At least transportation, construction, buildings, materials, and industrial activities (i.e., NACE L2: 10-18, 21-33, 41-43, 49-53, 81)
For reports published in 2025 onwards	Every sector

Since, starting with reports published in 2025, scope 3 emissions reporting is required for all sectors, this also holds for scope 3 emissions related to loans and investments into the financial sector. PCAF recognizes this may lead to double counting, similar to other types of double counting in scope 3. For that reason, separate reporting of financed emissions to the financial sector is recommended. In the case of two financial institutions provide mutual loans/investments, financial institutions **may** account for the other financial institutions' emissions without taking account the reverse loan/investment to prevent calculation loops.

ATTRIBUTION OF EMISSIONS

As a basic attribution principle, the financial institution accounts for a portion of the annual emissions of the financed company determined by the ratio between the institution's outstanding amount (numerator) and the value of the financed company (denominator). This ratio is called the attribution factor.[41]

1. **Outstanding amount (numerator):** This is the actual outstanding amount in listed equity or corporate bonds. It should be defined in line with the denominator. Therefore, the value of outstanding listed equity is defined based on its market value (i.e., market price times number of shares), and the value of outstanding corporate bonds is defined based on the book value of the debt that the borrower owes to the lender. Financial institutions should either use the calendar or financial year-end outstanding amount, provided the approach is communicated clearly and used consistently.
2. **Company value (denominator):** For all listed companies, this is the enterprise value including cash (EVIC) of the respective company. Only for traded bonds to private companies this is the sum

[41] The attribution factor calculation is, in principle, only possible for listed equity and corporate bonds where financial data specific to the borrower or investee is available. For listed equity and corporate bonds where such data is unavailable, the attribution factor cannot be calculated, but rough estimations on attribution can still be made based on region- and sector-specific average financial data and the outstanding amount. This is explained in more detail in the Equations to calculate financed emissions and Data required sections below (see Option 3b and Option 3c).

of total company equity[42] and debt,[43] which can be found on the client's balance sheet, as no market value for equity is available.[44]

For listed companies:

$$Attribution\ factor_c = \frac{Outstanding\ amount_c}{Enterprise\ Value\ Including\ Cash_c}$$

For bonds to private companies:

$$Attribution\ factor_c = \frac{Outstanding\ amount_c}{Total\ equity + debt_c}$$

(with c = borrower or investee company)

EVIC is defined as: The sum of the market capitalization of ordinary shares at fiscal year-end, the market capitalization of preferred shares at fiscal year-end, and the book values of total debt[45] and minorities' interests. No deductions of cash or cash equivalents are made to avoid the possibility of negative enterprise values.[46]

PCAF chose to align the definition of EVIC with the definition provided by the:

1. EU TEG in its Handbook of Climate Transition Benchmarks, Paris-Aligned Benchmark and Benchmarks' ESG Disclosure[47]
2. Commission Delegated Regulation (EU) 2020/1818 of 17 July 2020 Supplementing Regulation (EU) 2016/1011 of the European Parliament and of the Council as regards minimum standards for EU Climate Transition Benchmarks and EU Paris-aligned Benchmarks, which says EVIC should be used to determine the GHG intensities for the benchmarks.

---

[42] In cases where the total company equity value according to the client's balance sheet is negative, the financial institution shall set total equity to 0; this means that all emissions are attributed to debt only, while no emissions are attributed to equity investments. Such cases can happen when the retained earnings are negative while at the same time being higher than the other equity components on the balance sheet of the client—e.g., this often holds for startups that have high negative profits during their first years of operation. By this approach, for those companies that are doing well (i.e., they have high retained earnings), financial institutions attribute more emissions to equity providers; for those companies doing poorly (i.e., they have high retained losses), financial institutions attribute more emissions to debt providers. This is in line with the attribution factor rationale for listed companies, where the equity part of EVIC (i.e., market capitalization) also implicitly reflects retained earnings and losses (e.g., if retained earnings increase, the share price and market capitalization generally also increase).

[43] Total debt includes both current and long-term debt on the balance sheet.

[44] If total debt or total equity cannot be obtained from a client's balance sheet for whatever reason (e.g., for some it might be difficult to obtain these values), financial institutions are allowed to fall back to the total balance sheet value (i.e., the sum of total equity and liabilities, which is equal to the client's total assets) with the intention of improving this data quality in the future.

[45] In its EVIC definition, the EU Technical Expert Group (TEG) refers to "the book values of total debt" as including all debt listed on the company's balance sheet. This interpretation encompasses both interest-bearing and non-interest-bearing liabilities. Some accounting definitions may exclude non-interest-bearing items such as accounts payable and accrued liabilities, focusing instead on interest-bearing financial obligations. In cases where no information non-interest-bearing debt is available PCAF recommends to follow its precautionary principle (see next footnote), exclude this element from the total debt calculation.

[46] This is the standard definition of EVIC as provided by the EU TEG. For consistency reasons, PCAF decided to align with this definition to ensure maximum alignment on metrics in the market, which also enables data providers to collect data in a consistent way. In reality, specific elements of EVIC might not be readily available because data providers are still working on aligning their data with this definition. For cases where data is missing, the EU TEG (pg. 16 in its handbook of climate-related benchmarks) recommends conducting corporate GHG data estimations based on the UN's (1992) precautionary principle: "If in doubt, err on the side of the planet not the side of the company." Following this precautionary approach for EVIC calculations, financial institutions can decide to exclude elements of the EVIC (e.g., minority interests or certain elements of the book value of debt) as this would lead to a slightly lower EVIC and higher attribution of financed emissions to their own outstanding amount. These slight deviations from the standard EVIC definition are allowed as long as: (1) they are in line with this precautionary principle, and (2) the basis of the EVIC definition still includes the market value of equity (market capitalization) plus the total book value of debt of any given company.

[47] (EU Technical Expert Group on Sustainable Finance, 2019)

Box 5.1-2 further clarifies the rationale for using EVIC in the attribution factor of listed equity and corporate bonds.

Box 5.1-2. Rationale for EVIC as denominator in the attribution factor

As described in Subchapter 4.2 of the Standard, PCAF applies the same general attribution principles across all asset classes even though the actual equations and underlying (financial) data sources might differ per asset class. This principle defines that the attribution factor for all asset classes is calculated by determining the attribution factor of the outstanding amount of a financial institution over the total equity and debt of the company, project, property, etc. in which the financial institution is invested. Applying this principle means that, for the attribution of listed companies, a metric needed to be defined that includes both the equity and debt of a listed company.

EVIC was selected as the attribution metric for listed equity and corporate bonds because it

- Includes both equity and debt in line with PCAF attribution principles and other asset classes, ensuring alignment with similar asset classes (e.g., business loans).
- Is a common metric in the financial sector of a company's total value and is expected to gain more dominance because of its adoption by the EU TEG and the benchmark regulation.
- Is based on company data (market value of equity and total book value of debt), which is generally available to financial institutions and data providers. The availability of this data is expected to be further improved due to the EU climate benchmarks regulation, which will stimulate data providers to collect EVIC data.
- Includes market valuation of equity, which is the most common approach in the financial sector to determine company ownership.
- Avoids issues with negative enterprise values due to the inclusion of cash (not deducting cash as in the regular enterprise value definition) as well as issues with attributing more than 100% of a company's emissions to financial institutions.

The simplified example below highlights how EVIC ensures 100% attribution of company emissions by not deducting cash.

Example Company: Equity = 50, Debt=50, Cash=20

Approaches	Enterprise value	Attribution to equity	Attribution to debt	Total
EV excl. cash (standard)	50 + 50 - 20 = 80	50 /80 = 63%	50 / 80 = 63%	> 100%
EV incl. cash	50 + 50 = 100	50 / 100 = 50%	50 / 100 = 50%	100%

For loans and investments into other financial institutions, the book value of debt (which is part of total equity + debt for private companies and part of EVIC for listed companies) includes customer deposits as these form a substantial part of the funding base and facilitate the economic activities of financial institutions similar to debt and equity.

EQUATIONS TO CALCULATE FINANCED EMISSIONS

The financed emissions of a loan or investment in a company are calculated by multiplying the attribution factor by the emissions of the respective borrower or investee company. The total financed emissions of a listed equity and corporate bonds portfolio are calculated as follows[48]:

$$Financed\ emissions = \sum_{c} Attribution\ factor_c\ x\ Company\ emissions_c$$

(with c = borrower or investee company)

The attribution factor represents the proportional share of a given company —that is, the ratio of the outstanding amount to EVIC for listed companies and the total equity and debt for bonds to private companies:

For listed companies:

$$Financed\ emissions = \sum_{c} \frac{Outstanding\ amount_c}{Enterprise\ Value\ Including\ Cash_c}\ x\ Company\ emissions_c$$

For bonds to private companies:

$$Financed\ emissions = \sum_{c} \frac{Oustanding\ amount_c}{Total\ equity + debt_c}\ x\ Company\ emissions_c$$

The financed emissions from listed equity and corporate bonds can be calculated in different ways depending on the availability of financial and emissions data specific to the borrower and investee. Overall, PCAF distinguishes three different options to calculate the financed emissions from listed equity and corporate bonds depending on the emissions data used:

- **Option 1: reported emissions,** where verified[49] or unverified[50] emissions are collected from the borrower or investee company directly (e.g., company sustainability report) or indirectly via verified third-party data providers (e.g., CDP) and then allocated to the reporting financial institutions using the attribution factor.
- **Option 2: physical activity-based emissions**, where emissions are estimated by the reporting financial institution based on primary physical activity data collected from the borrower or investee company (e.g., megawatt-hours of natural gas consumed or tons of steel produced) and then allocated to the reporting financial institution using the attribution factor. The emissions data should

[48] Wherein a financial institution is lending to or investing in a subsidiary of a larger entity, the attribution should be accounted at the subsidiary level according to the "follow the money" principle, if the financial institution has balance sheet information on the subsidiary. If the subsidiary's balance sheet is unavailable, the financial institution should calculate the attribution factor based on the total balance sheet of the entity to whom the financial institution has recourse for repayment of the loan

[49] This refers to reported emissions being calculated in line with the GHG Protocol and verified by a third-party auditor.

[50] This refers to reported emissions being calculated in line with the GHG Protocol without verification by a third-party auditor. Unverified reported emissions can be calculated by either an external party or by the borrower or investee company itself.

be estimated using an appropriate calculation methodology or tool with verified emission factors expressed per physical activity (e.g., tCO_2 e/MWh or tCO_2 e/t of steel) issued or approved by a credible independent body.

- **Option 3: economic activity-based emissions**, where emissions are estimated by the reporting financial institution based on economic activity data collected from the borrower or investee company (e.g., euro/dollar of revenue or euro/dollar of sectoral assets) and then allocated to the reporting financial institution using the attribution factor. The emissions data should be estimated using official statistical data or acknowledged environmentally extended input-output (EEIO) tables providing region- or sector-specific average emission factors expressed per economic activity (e.g., tCO_2 e/€ or $ of revenue or tCO_2 e/€ or $ of sectoral assets).[51]

DATA REQUIRED

PCAF distinguishes three options to calculate the financed emissions from listed equity and corporate bonds depending on the emissions data used:

- Option 1: reported emissions
- Option 2: physical activity-based emissions
- Option 3: economic activity-based emissions

While Options 1 and 2 are based on company-specific reported emissions or primary physical activity data provided by the borrower or investee or third-party data providers, Option 3 is based on region- or sector-specific average emissions or financial data obtained from public data sources such as statistics or data from other third-party providers.[52]

Options 1 and 2 are preferred over Option 3 from a data quality perspective because they provide more accurate emissions results to a financial institution. Due to data limitations, financial institutions might use Option 1 or 2 for certain companies and Option 3 for others. The data quality mix shall be reflected in the average data quality score, as Chapter 6 illustrates.

Table 5.1-2 provides data quality scores for each of the described options and sub-options (if applicable) that can be used to calculate the financed emissions for listed equity and corporate bonds.

[51] Sampling tests based on actual data on the company level extrapolated to the portfolio level can help to test the accuracy of calculations based on this data from statistics or EEIO tables. This may also be used to refine the data for specific sectors or regions if the reporting financial institution has a strong presence in and specific knowledge of the respective sector or region. National agencies and regional data providers or statistical offices in individual regions may assist reporting financial institutions and investee companies in various regions in finding regional and more relevant financial or emissions data information.

[52] Option 1 and Option 2 were called "Approach 1: company specific approach" and Option 3 was called "Approach 2: Sector/region average approximation" in the report produced by the PCAF Dutch team: (PCAF, 2019).

Table 5.1-2. General description of the data quality score table for listed equity and corporate bonds

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

Data Quality	Options to estimate the financed emissions		When to use each option
Score 1	Option 1: Reported emissions	1a	Outstanding amount in the company and EVIC or Total debt and equity are known. **Verified emissions** of the company are available.
Score 2		1b	Outstanding amount in the company and EVIC or Total debt and equity are known**. Unverified emissions** calculated by the company are available.
	Option 2: Physical activity-based emissions	2a[53]	Outstanding amount in the company and EVIC or Total debt and equity are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data of the **company's energy consumption** and emission factors[54] specific to that primary data. Relevant process emissions are added.
Score 3		2b	Outstanding amount in the company and EVIC or Total debt and equity are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data of the **company's production** and emission factors specific to that primary data.
Score 4	Option 3: Economic activity-based emissions	3a	Outstanding amount in the company, EVIC or Total debt and equity, and the **company's revenue**[55] are known. Emission factors for the sector per unit of revenue are known (e.g., tCO_2e per euro or dollar of revenue earned in a sector).
Score 5		3b	Outstanding amount in the company is known. Emission factors for the sector per unit of asset (e.g., tCO_2e per euro or dollar of asset in a sector) are known.
		3c	Outstanding amount in the company is known. Emission factors for the sector per unit of revenue (e.g., tCO_2e per euro or dollar of revenue earned in a sector) and **asset turnover ratios** for the sector are known.

A detailed summary of the data quality score table, including data needs and equations to calculate financed emissions, is provided in Annex 10.1 (Table 10.1-1). Data for all three options in Table 5.1-2 can be derived from different data sources.

[53] The quality scoring for the Option 2a is only possible for/applicable to scope 1 and scope 2 emissions as scope 3 emissions cannot be estimated by this option. Other options can be used to estimate the scope 3 emissions, however.
[54] Supplier-specific emission factors or market-based emission factors (e.g., from electricity provider) for the respective primary activity data are always preferred over non-supplier-specific emission factors.
[55] If revenue is not deemed a suitable financial indicator for estimating the emissions of a company in a certain sector, one can apply other suitable financial indicators as a proxy. If an alternative indicator is used, the reasoning for the selection of this alternative indicator should be made transparent. The data quality score will not be affected.

Official company filings

Where available, PCAF recommends using emissions data reported by companies, given the data fully covers a company's emissions-generating activities disclosed in official filings and environmental reports. The most recent available data should be used with reference to the data source, reporting period, or publication date. Using this data is in line with Option 1.

Data providers (Option 1)

For Option 1 (reported emissions), PCAF recommends either collecting emissions from the borrower or investee company directly (e.g., company sustainability report) or third-party data providers, such as CDP, Bloomberg, MSCI, Sustainalytics, S&P/Trucost, and ISS ESG. Data providers typically make scope 1 and 2 emissions data available. PCAF encourages using the most recent available data and to mention the data source, reporting period, or publication date.

Data providers collect emissions data as reported by the companies themselves, either through a standardized framework such as CDP or through a company's own disclosures in official filings and environmental reports. They often have their own methodologies to estimate/calculate companies' emissions, especially if this data is not reported. In this case, the calculation would be in line with Options 2 or 3, assuming the methodology used is in line with the GHG Protocol. Financial institutions should ask data providers to be transparent, disclose the calculation method they use, and confirm alignment with the GHG Protocol. This will enable financial institutions to apply the proper score to the data. PCAF also encourages data providers to apply the PCAF scoring method to their own data, which would allow them to share the data quality scores directly with their clients.

PCAF does not recommend a preferred data vendor. PCAF recommends using data providers that use the standardized CDP framework and suggests data providers disclose the data quality score according to the scoring hierarchy in Table 5.1-2.[56] When using data providers, PCAF recommends using the same provider for all equity and bonds due to the variability of scope 1 and 2 emissions observed by providers.

Estimation models (Option 2 and 3)

Not all companies disclose their emissions data in official filings or through data providers. Reporting in emerging markets often lags that of developed markets. To maximize the coverage of emissions data, the remaining gaps are often filled with estimates.

If no data is available, estimation models consistent with the emissions from the primary business activity may be used. Emission factors from production-based models (i.e., emission intensity per physical activity) are preferred over emission factors from revenue-based models (i.e., emission intensity per revenue) because the former are less sensitive to fluctuations in exchange rates or commodity prices. Emission factors from production-based models in line with Option 2 are especially useful for emission-intensive industries like utilities, materials, energy, and industrials. Emission factors from revenue-based models in line with Option 3 (e.g., intensity-based or environmental input-output models) have the advantage of requiring less detailed data from the financial institution.

[56] More information about CDP can be found at: https://www.cdp.net/en

For Option 2 (physical activity-based emissions), PCAF recommends using actual energy consumption (e.g., megawatt-hours of natural gas consumed) or production (e.g., tons of steel produced) data reported by companies, given the data fully covers the company's emissions-generating activities. The emission factors expressed per physical activity used should be based on appropriate and verified calculation methodologies or tools issued or approved by a credible, independent institution. Example data sources for retrieving emission factors are ecoinvent,[57] Defra,[58] Intergovernmental Panel on Climate Change (IPCC),[59] GEMIS (Global Emissions Model for integrated Systems),[60] and Food and Agriculture Organization of the United Nations (FAO) [61]. The most recent available data should be used, including a mention of the data source, reporting period, or publication date.

For Option 3 (economic activity-based emissions), PCAF recommends using official statistical data or acknowledged EEIO tables providing region- or sector-specific average emission factors expressed per economic activity (e.g., tCO_2 e/€ or $ of revenue or tCO_2 e/€ or $ of sectoral assets). Financial institutions should use emission factors that are as consistent as possible with the primary business activity financed. For example, for a business loan to a paddy rice farmer the financial institution should seek to find and use a sector-specific average emission factor for the paddy rice sector and not an emission factor for the agricultural sector in general. Also, for loans to other financial institutions (if PCAF-aligned reported numbers are not available) the financed scope 3 category 15 emissions can be estimated based on a data quality score 5 approach. This may involve assessing the sectoral distribution of the financial institution, receiving the loan and applying appropriate emission factors from EEIO databases. If sectoral breakdowns are unavailable, the financed scope 3 category 15 emissions can be estimated by applying an economy-wide average emission factor to the total portfolio value.

Example EEIO databases that can be used to obtain such emission factors are EXIOBASE,[62] CEDA,[63] GTAP,[64] or WIOD.[65] PCAF's web-based emission factor database provides a large set of emission factors for Options 2 and 3. The database, which is currently available only to PCAF signatories, can help financial institutions get started by estimating the financed emissions of their investments.

PCAF expects that the financed emissions for most listed equity and corporate bonds can be derived through either reported emissions (Option 1), physical activity data (Option 2), or economic activity data (Option 3). If none of the specified options are applicable, PCAF allows the use of alternative options to calculate emissions. Any deviation from the specified options shall be accompanied by an explanation from the reporting financial institution.

[57] More information can be found at: https://www.ecoinvent.org/
[58] More information can be found at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conedition-factors-2019
[59] More information can be found at: https://www.ipcc-nggip.iges.or.jp/EFDB/find_ef.php
[60] More information can be found at: http://iinas.org/gemis-download.html
[61] More information can be found at: http://www.fao.org/partnerships/leap/database/ghg-crops/en
[62] More information can be found at: https://www.exiobase.eu
[63] More information can be found at: https://watershed.com/solutions/ceda
[64] More information can be found at: https://www.gtap.agecon.purdue.edu
[65] More information can be found at: http://www.wiod.org

EMISSION REMOVALS

Companies in an FI's portfolio should report on emission removals, whether nature- or technology-based,[66] as part of their GHG reporting. Reporting should follow existing GHG Protocol guidance, and emission removals shall be reported separately from both absolute emissions and any carbon credits retired and generated.

Carbon credits generated by companies should be reported, and carbon credits retired may be reported. These figures can provide transparency and context for the financed emissions and removals. Ultimately, the goal of the PCAF Financed Emissions Standard is to transparently report the total emissions impacts of lending and investments, not diluted by credits retired or generated.

FIs can calculate attribution of companies' reported emission removals using the existing attribution logic set out in this chapter (see formula below); this same logic applies to any attribution of companies' reported credits retired or generated.

$$Emission\ removals = \sum_{c} \frac{Outstanding\ investment_c}{EVIC\ or\ Total\ company\ equity + debt_c}\ x\ Company\ emission\ removals_c$$

(with c = borrower or investee company)

Example accounting – a portfolio of different companies

An FI invests into multiple companies with different emissions profiles as illustrated in the following table. All numbers are in tCO_2 e for the reporting year 2020 and are dummy data for the purpose of this example.

Table 5.1-3: Example of data input for calculating a portfolio of different companies

	Scope 1	Scope 2	Scope 3	Emission removals	Carbon credits retired	Carbon credits generated	Attribution factor
Forestry company	1,000	100	5,000	20,000	0	5,000	10%
Industrial company	20,000	5,000	30,000	0	25,000	0	25%
Energy company	5,000	0	10,000	1,000	5,000	500	20%

The portfolio contains a forestry company that sells carbon credits based on its forestry activities, an industrial company that buys carbon credits based on forestry activities, and a green energy company that builds renewable energy plants combined with afforestation activities. The FI would report aggregated numbers for this portfolio per the table below. This table sums the attributed emissions and credits of the

[66] Note that new GHG Protocol guidance is being developed on accounting for land sector activities and CO_2 removals in corporate GHG inventories, building on the Corporate Standard and Scope 3 Standard. Draft guidance for this is expected in 2022. Where necessary, the PCAF Global Standard will be updated in line with the final version of the new GHG Protocol guidance

forestry, industrial, and energy companies from the table above. Note that reporting carbon credits retired by clients is optional.

Table 5.1-4: Calculation example portfolio of different companies

Based on companies in above table	Calculation	Total portfolio number
Scope 1 – Absolute emissions	1,000 x 10% + 20,000 x 25% + 5,000 x 20%	6,100
Scope 2 – Absolute emissions	100 x 10% + 5,000 x 25%	1,260
Scope 3 – Absolute emissions	5,000 x 10% + 30,000 x 25% + 10,000 x 20%	10,000
Emission removals	20,000 x 10% + 1,000 x 20%	2,200
Carbon credits retired	25,000 x 25% + 5,000 x 20%	7,250
Carbon credits generated	5,000 x 10% + 500 x 20%	600

FIs may further subdivide these overall reporting categories into subcategories. For example, carbon credits retired may be further reported separately by specific type of credit (e.g., emissions "avoidance" versus "removal")[67] or classified based on the credit standard (e.g., Verified Carbon Standard (VCS) or Gold Standard). The FI may choose to separately report 'net' numbers that display total absolute emissions minus total emission removals, for example. Nonetheless, for the purposes of this Financed Emissions Standard, the fundamental requirement is that reporting should at a minimum include separate numbers for absolute emissions and emission removals, in addition to any 'net' numbers.

Example tool to calculate emission removals – the FoRESt Carbon Sequestration (FRESCOS) Tool

FMO has been working with three other European development finance institutions (CDC, Finnfund, and Swedfund) and Finnish forestry expert Simosol to build an online tool to estimate the amount of carbon sequestered through plantation and agroforestry operations, called the FRESCOS Tool. The tool is built upon the IPCC Guidelines for National GHG Inventories and can be found at https://www.frescos.earth. While PCAF does not endorse the use of this tool specifically, the FRESCOS Tool is an example of a tool that can be used by FIs as a basis for calculating financed emission removals. The FRESCOS tool is open for other FIs and interested parties to use.

LIMITATIONS

Market value fluctuations

When using EVIC as the denominator, calculated financed emissions might change as a result of fluctuating market prices. Applying corrections to EVIC could address this issue; however, the application of inconsistent approaches can influence and reduce the comparability of results between different financial institutions. In addition, corrections could theoretically be applied to many other variables, like exchange rates, inflation, and emerging versus developed markets, further reducing comparability. For that reason, all financial institutions shall report their unadjusted, absolute financed emissions in accordance

[67] Reporting around the use of carbon offsets may need to evolve because it does not yet consistently distinguish between avoidance and removal offsets.

with the calculations required by the PCAF standard. However, financial institutions may optionally report their adjusted absolute financed emissions with the requirement that such amounts must be disclosed separately along with a description of the methodology, inputs and models utilized to calculate the corrections to EVIC. Both unadjusted and adjusted absolute finance emissions will be required for all periods disclosed in the financial reports being presented.

When asset owners and asset managers convert absolute financed emissions into economic emissions intensity by assets under management, market price fluctuations also influence the denominator. Correcting this fluctuation can be approached as illustrated in the example below. This approach was tested by asset owners and asset managers. Further research is needed to evaluate whether this adjustment factor is also applicable for banks when using an economic emissions intensities over total loan exposure.

Box 5.1-3. An approach for asset owners and managers to correct economic emissions intensity[68]

For asset owners and managers, the economic emission intensity is a commonly used metric for reporting and target setting purposes. The economic emission intensity is shown in the equation below and reflects absolute emissions associated with investments normalized for the total size of the portfolio or assets under management.

$$\textbf{Economic emission intensity} = \sum_i \frac{\frac{\textbf{Outstanding amount}_i}{\textbf{Investee company's EVIC}_i} \textbf{ x Investee company's emissions}_i}{\textbf{Total oustanding amount or assets under management (AuM)}}$$

When using this metric, especially the denominator is influenced by market value fluctuations. In a bull market where valuation would increase, all else kept equal (GHG emissions and ownership unchanged), the denominator would increase and as a result the economic emission intensity would decrease. Under the influence of these fluctuations, an objective to reduce the economic emission intensity by a certain percentage becomes a moving target. This undermines the utility of the metric to make comparisons from one time period to the next.

To address this limitation regarding the economic emission intensity, the EU TEG and EU regulation on benchmarks suggest that asset owners/managers correct EVIC over time by applying an inflation correction. Building on the EU inflation correction, PCAF recommends that asset owners/managers adjust the economic emission intensity with the following adjustment factor. The adjustment factor should be calculated as:

$$\textbf{ADJ}_{b,T} = \sum_i \textbf{W}_T \textbf{ x } \frac{\textbf{EVIC}_b}{\textbf{EVIC}_T}$$

(With b = base year and T = current year and W_T = benchmarks weights at time T)

[68] For guidance on disclosing a fluctuation analysis to explain changes in absolute financed emissions between reporting periods, see the Fluctuation Analysis subsection in Chapter 6: Reporting requirements and recommendations.

There are two options for adjusting the economic emission intensity (backward or current):

1. The economic emission intensity can be adjusted in the base year (backward). Benefits of adjusting the base year are that current reported carbon figures remain unadjusted. Moreover, EVIC inflation correction applied to the baseline can be combined with other adjustments that may be required, for example for data improvements or a changing universe composition.

To calculate adjusted economic emission intensity in the base year (b):

$$Economic\ emission\ intensity^{adjusted}(b) = Economic\ emission\ intensity\ (b)\ x\ ADJ_{b,T}$$

2. The economic emission intensity can also be adjusted for the current reporting year. Benefits of adjusting the current year are intuitiveness for annual reporting, where the focus is usually on the metrics associated with the current year. Similarly, when assessing progress against an objective to reduce the economic emission intensity by a certain percentage, it is intuitive to keep the base emission intensity consistent.

To calculate adjusted economic emission intensity in current reporting year (T):

$$Economic\ emission\ intensity^{adjusted}(T) = Economic\ emission\ intensity(T)\ x\ \frac{1}{ADJ_{b,T}}$$

If asset owners/managers decide to apply this adjustment factor, PCAF requires them to report both the unadjusted as adjusted economic emissions intensity separately. For transparency, ideally the adjustment factor used and an explanation of how this was constructed and applied would also be included.

Calculation example of applying the adjustment factor

Base year b						
Company	**Emissions (tCO_2e)**	**Market cap (M$)**	**Debt (M$)**	**EVIC (M$)**	**Weight**	**Emissions/EVIC (tCO_2e/M$)**
A	60,000	800	400	1,200	40%	50
B	100,000	600	400	1,000	30%	100
C	120,000	400	400	800	20%	150
D	120,000	200	400	600	10%	200
Base year T						
Company	**Emissions (tCO_2e)**	**Market cap (M$)**	**Debt (M$)**	**EVIC (M$)**	**Weight**	**Emissions/EVIC (tCO_2e/M$)**
A	60,000	960	400	1,360	40%	44
B	100,000	720	400	1,120	30%	89
C	120,000	480	400	880	20%	136
D	120,000	240	400	640	10%	188

Backward/base year adjustment					
	Plain (tCO2 eq/M$)	Adjusted (tCO2 /M$)		EVIC_b/ EVIC_T	Adjustment
Carbon footprint b	100	89.6		0.88	0.896
Carbon footprint T	90			0.89	
				0.91	
				0.94	
Current year adjustment					
	Plain (tCO2 eq/M$)	Adjusted (tCO2 /M$)		EVIC_b/ EVIC_T	Adjustment
Carbon footprint b	100			0.88	0.896
Carbon footprint T	90	100.9		0.89	
				0.91	
Decarbonization Adjust T	0.914%			0.94	
Decarbonization Adjust b	0.914%				

Organization identifiers

For larger listed equity and corporate bond portfolios, organization identifiers should be in place to combine information from various sources. Examples of such identifiers include the Stock Exchange Daily Official List, Legal Entity Identifier (LEI), International Securities Identification Number (ISIN), and Committee on Uniform Security Identification Procedures numbers (CUSIP). For large portfolios, matching external data sources can be a challenge when two companies merge; the organization identifiers will be adjusted immediately while emissions data providers might only update such information on an annual basis.

Business loans and unlisted equity

PCAF®
Partnership for Carbon Accounting Financials

5.2 Business loans and unlisted equity

ASSET CLASS DEFINITION

This PCAF asset class comprises:

- Business loans to private and listed companies
- Equity investments in private companies, also referred to as unlisted equity

Business loans

Business loans include all on-balance sheet loans and lines of credit to listed and unlisted businesses, nonprofits, and any other structure of organization[69] that and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol.[70] Revolving credit facilities, overdraft facilities, and business loans secured by real estate such as CRE-secured lines of credit are also included. Any off-balance sheet loans and lines of credit are excluded.

For financing products such as revolving credit facilities, bridge loans, and letters of credit, which are commonly provided by financial institutions, only those loans outstanding on the year-end balance sheet of the financial institution are covered by this asset class.[71]

Methods for financed emissions from business loans for specific corporate purposes (i.e., with known use of proceeds) are not included in this asset class but are instead covered by the following asset classes: the Commercial Real estate (see subchapter 5.4), Mortgages (see subchapter 5.5), Motor Vehicle Loans (see subchapter 5.6),and Use of Proceed Structures (see subchapter 5.7).[72] Detailed guidance on choosing an appropriate asset class can be found in Figure 5-1.

Unlisted equity

Unlisted equity includes all on-balance sheet equity investments to businesses, nonprofits, and any other structure of organization that are not traded on a market and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol. Unlisted equity is also referred to as equity investments in private companies (i.e., the financial institution obtains shares of the company) throughout the Financed Emissions Standard.

Private equity that refers to investment funds is not included in this asset class; guidance on such private equity is included in Use of Proceeds Structures (see subchapter 5.7).

---

[69] This also includes governmental-owned enterprises (e.g., state-owned companies such as municipal energy or public transport providers), while loans to governments themselves are excluded. Loans to governments (i.e., governmental lending) is covered in the Sovereign Debt and Sub-Sovereign Debt asset class (see subchapter 5.7).

[70] The term "company" is used throughout this subchapter but can refer to any type of organization, including nonprofits.

[71] More detailed guidance on such financing is under development and will be published in later editions of the Standard; this guidance will elaborate further on how to account for the significant interannual fluctuations of such financial products that may not be captured appropriately when only considering the year-end balance sheet of a financial institution. For now, financial institutions should be transparent on any major last minute increases or decreases at fiscal year-end because this can increase or decrease the financed emissions from business loans significantly.

[72] Financial institutions can still report their financed emissions from such business loans for specific corporate purposes (i.e., with known use of proceeds) under an asset class called "business loans" if that is the name commonly used or preferred by the financial institution (e.g., when reporting internally or externally).

EMISSION SCOPES COVERED

Financial institutions **shall** report the absolute scope 1, scope 2 and scope 3 emissions of borrowers and investees across all sectors. Financial institutions **shall** separately disclose absolute scope 3 emissions from scope 1 and 2 emissions of borrowers and investees.

Since, starting with reports published in 2025, scope 3 emissions reporting is required for all sectors, this also holds for scope 3 emissions related to loans and investments into the financial sector. PCAF recognizes this may lead to double counting, similar to other types of double counting in scope 3. For that reason, separate reporting of financed emissions to the financial sector is recommended. In the case of two financial institutions provide mutual loans/investments, financial institutions **may** account for the other financial institutions' emissions without taking account the reverse loan/investment to prevent calculation loops.

Refer to Box 5.1-1 in Chapter 5.1 for more information on PCAF's former phase-in approach for reporting scope 3 emissions of borrowers and investees in previous editions of the PCAF Global GHG Accounting and Reporting Standard.

ATTRIBUTION OF EMISSIONS

As a basic attribution principle, the financial institution accounts for a portion of the annual emissions of the borrower and investee, as determined by the ratio between the outstanding amount (numerator) and the value of the financed company (denominator). This ratio is called the attribution factor.[73]

1. **Outstanding amount (numerator):** This is the actual outstanding loan amount.
   a) For business loans, this is defined as the value of the debt that the borrower owes to the lender (i.e., disbursed debt minus any repayments). It will be adjusted annually to reflect the correct exposure, resulting in the attribution to decline to 0 at the end of the lifetime of the loan (i.e., when it is fully repaid).
   b) For unlisted equity (i.e., equity investments in private companies), the outstanding amount is the outstanding value of equity that the financial institution holds in the private company. It is calculated by multiplying the relative share of the financial institution in the respective investee[74] by the total equity of the respective investee according to its balance sheet. Financial institutions should either use the calendar or financial year-end outstanding amount, provided the approach is communicated and used consistently.

[73] The attribution factor calculation is, in principle, only possible for business loans and unlisted equity where client-specific financial data is available. For business loans and unlisted equity where such data is unavailable, the attribution factor cannot be calculated but rough estimations on attribution can still be made based on region- and sector-specific average financial data and the actual outstanding amount. This is explained in more detail in the Equations to calculate financed emissions and Data required sections below (see Option 3b and Option 3c).
[74] The relative share of the financial institution in the respective investee is calculated by dividing the number of shares that the financial institution holds in the respective investee by the total number of shares of the investee.

2. **Company value (denominator):**
   1. For business loans and equity investments to/in private companies, this is the sum of total company equity[75] and debt,[76] which can be found on the client's balance sheet.[77]
   2. For business loans to listed companies, this is the company enterprise value including cash (EVIC) of the respective client.

For business loans and equity investments to/in private companies:

$$Attribution\ factor_c = \frac{Outstanding\ amount_c}{Total\ equity + debt_c}$$

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

$$\frac{\#\ shares\ of\ financial\ institution_c}{\#\ total\ shares_c}\ x\ Total\ equity_c$$

For business loans to listed companies:

$$Attribution\ factor_c = \frac{Outstanding\ amount_c}{Enterprise\ Value\ Including\ Cash_c}$$

(with c=borrower or investee company)

EVIC is defined as: The sum of the market capitalization of ordinary shares at fiscal year-end, the market capitalization of preferred shares at fiscal year-end, and the book values of total debt[78] and minorities' interests. No deductions of cash or cash equivalents are made to avoid the possibility of negative enterprise values.[79]

---

[75] In cases where the total company equity value according to the client's balance sheet is negative, the financial institution shall set total equity to 0; this means that all emissions are attributed to debt only, while no emissions are attributed to equity investments. Such cases can happen when the retained earnings are negative while at the same time being higher than the other equity components on the balance sheet of the client—e.g., this often holds for startups that have high negative profits during their first years of operation. By this approach, or those companies that are doing well (i.e., they have high retained earnings), financial institutions attribute more emissions to equity providers; for those companies doing poorly (i.e., they have high retained losses), financial institutions attribute more emissions to debt providers. This is in line with the attribution factor rationale for listed companies, where the equity part of EVIC (i.e., market capitalization) also implicitly reflects retained earnings and losses (e.g., if retained earnings increase, the share price and thus the market capitalization generally also increase).

[76] Total debt includes both current and long-term debt on the balance sheet.

[77] If total debt or total equity cannot be obtained from a client's balance sheet for whatever reason (e.g., for some it might be difficult to obtain these values), financial institutions are allowed to fall back to the total balance sheet value (i.e., the sum of total equity and liabilities, which is equal to the client's total assets) with the intention of improving this data quality in the future.

[78] In its EVIC definition, the EU TEG refers to "the book values of total debt," including all debt as listed on the company balance sheet. This is different from some accounting definitions of book value of debt, which exclude some elements like non-interest bearing debt (also see next footnote on precautionary principle).

[79] This is the standard definition of EVIC as provided by the EU TEG. For consistency reasons, PCAF decided to align with this definition to ensure maximum alignment on metrics in the market, which also enables data providers to collect data in a consistent way. In reality, specific elements of EVIC might not be readily available because data providers are still working on aligning their data with this definition. For cases where data is missing, the EU TEG (pg. 16 in its handbook of climate-related benchmarks) recommends conducting corporate GHG data estimations based on the UN's (1992) precautionary principle: "If in doubt, err on the side of the planet not the side of the company." Following this precautionary approach for EVIC calculations, financial institutions can decide to exclude elements of the EVIC (e.g., minority interests or certain elements of the book value of debt) as this would lead to a slightly lower EVIC and higher attribution of financed emissions to their own outstanding amount. These slight deviations from the standard EVIC definition are allowed as long as they are: (1) in line with this precautionary principle, and (2) the basis of the EVIC definition still includes the market value of equity (market capitalization) plus the total book value of debt of any given company.

PCAF chose to align the definition of EVIC with the definition provided by the:

1. EU TEG in its Handbook of Climate Transition Benchmarks, Paris-Aligned Benchmark and Benchmarks' ESG Disclosure[80]
2. **Commission Delegated Regulation (EU) 2020/1818 of 17 July 2020** Supplementing Regulation (EU) 2016/1011 of the European Parliament and of the Council as regards minimum standards for EU Climate Transition Benchmarks and EU Paris-aligned Benchmarks, which says EVIC should be used to determine the GHG intensities for the benchmarks.

Further clarification on the rationale for using EVIC for the attribution of listed companies is provided in the asset class subchapter 5.1 on Listed Equity and Corporate Bonds.

For loans and investments into other financial institutions, the book value of debt (which is part of total equity + debt for private companies and part of EVIC for listed companies) includes customer deposits as these form a substantial part of the funding base and facilitate the economic activities of financial institutions similar to debt and equity.

EQUATIONS TO CALCULATE FINANCED EMISSIONS

The financed emissions from business loans and unlisted equity are calculated by multiplying the attribution factor by the emissions of the borrower or investee company and then taking the sum of these emissions:[81]

$$Financed\ emissions = \sum_{c} Attribution\ factor_c\ x\ Company\ emissions_c$$

(with c=borrower or investee company)

The attribution factor represents the proportional share of a given company—that is, the ratio of the outstanding amount to total equity and debt for private companies and EVIC for listed companies:

For business loans and equity investments to/in private companies:

$$Financed\ emissions = \sum_{c} \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Company\ emissions_c$$

For business loans to listed companies:

$$Financed\ emissions = \sum_{c} \frac{Outstanding\ amount_c}{Enterprise\ Value\ Including\ Cash_c}\ x\ Company\ emissions_c$$

(with c=borrower or investee company)

[80] (EU Technical Expert Group on Sustainable Finance, 2019)
[81] Wherein a financial institution is lending to or investing in a subsidiary of a larger entity, the attribution should be accounted at the subsidiary level according to the "follow the money" principle, if the financial institution has balance sheet information on the subsidiary. If the subsidiary balance sheet is unavailable, the financial institution should calculate the attribution factor based on the total balance sheet of the entity to whom the financial institution has recourse for repayment of the loan.

The financed emissions from business loans and unlisted equity can be calculated in different ways depending on the availability of financial and emissions data specific to the borrower or investee. Overall, PCAF distinguishes three different options to calculate the financed emissions from business loans and unlisted equity depending on the emissions data used.

- Option 1: Reported emissions, where verified[82] or unverified[83] emissions are collected from the borrower or investee company directly (e.g., company sustainability report) or indirectly via verified third-party data providers (e.g., CDP) and then allocated to the reporting financial institution using the attribution factor.
- Option 2: Physical activity-based emissions, where emissions are estimated by the reporting financial institution based on primary physical activity data collected from the borrower or investee (e.g., megawatt-hours of natural gas consumed or tons of steel produced) and then allocated to the reporting financial institution using the attribution factor. The emissions data should be estimated using an appropriate calculation methodology or tool with verified emission factors expressed per physical activity (e.g., tCO2 e/MWh or tCO2 e/t of steel) issued or approved by a credible independent body.
- Option 3: Economic activity-based emissions, where emissions are estimated by the reporting financial institution based on economic activity data collected from the borrower or investee company (e.g., euro/dollar of revenue or euro/dollar of asset) and then allocated to the reporting financial institution using the attribution factor. The emissions data should be estimated using official statistical data or acknowledged EEIO tables providing region or sector-specific average emission factors expressed per economic activity (e.g., tCO2 e/€ or $ of revenue or tCO2 e/€ or $ of sectoral assets).[84]

DATA REQUIRED

As described, PCAF distinguishes three options to calculate the financed emissions from business loans and unlisted equity depending on the emissions data used:

- Option 1: reported emissions
- Option 2: physical activity-based emissions
- Option 3: economic activity-based emissions

While Options 1 and 2 are based on company-specific reported emissions or primary physical activity data provided by the borrower or investee company or third-party data providers, Option 3 is based on region- or sector-specific average emissions or financial data obtained from public data sources such as statistics or data from other third-party providers.[85]

[82] This refers to reported emissions being calculated in line with the GHG Protocol and verified by a third-party auditor.
[83] This refers to reported emissions being calculated in line with the GHG Protocol without verification by a third party-auditor. Unverified reported emissions can be calculated by either an external party or by the borrower or investee company itself.
[84] Sampling tests based on actual data on the company level extrapolated to the portfolio level can help to test the accuracy of calculations based on this data from statistics or EEIO tables. This may also be used to refine the data for specific sectors or regions if the reporting financial institution has a strong presence in and specific knowledge of the respective sector or region. National agencies and regional data providers or statistical offices in individual regions may assist reporting financial institutions and investee companies in various regions in finding regional and more relevant financial or emissions data information.
[85] Option 1 and Option 2 were called "Approach 1: company specific approach" and Option 3 was called "Approach 2: Sector/region average approximation" in the report produced by the PCAF Dutch team: (PCAF, 2019).

Options 1 and 2 are preferred over Option 3 from a data quality perspective because they provide more accurate emissions results to a financial institution. Due to data limitations, financial institutions might use Options 1 or 2 for certain companies and Option 3 for others. The data quality mix shall be reflected in the average data quality score, as Chapter 6 illustrates. Table 5.2-1 provides data quality scores for each of the described options and sub-options (if applicable) that can be used to calculate the financed emissions for business loans and unlisted equity.

Table 5.2-1. General description of the data quality score table for business loans and unlisted equity[86]

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

Data Quality	Options to estimate the financed emissions		When to use each option
Score 1	Option 1: Reported emissions	1a	Outstanding amount in the company and total company equity plus debt are known. **Verified emissions** of the company are available.
Score 2		1b	Outstanding amount in the company and total company equity plus debt are known. **Unverified emissions** calculated by the company are available.
	Option 2: Physical activity-based emissions	2a[87]	Outstanding amount in the company and total company equity plus debt are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data for the company's energy **consumption** and emission factors specific to that primary data. Relevant process emissions are added.
Score 3		2b	Outstanding amount in the company and total company equity plus debt are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data of the **company's production** and emission factors specific to that primary data.
Score 4	Option 3: Economic activity-based emissions	3a	Outstanding amount in the company, total company equity plus debt, and the **company's revenue**[88] are known. Emission factors for the sector per unit of revenue are known (e.g., tCO2 e per euro or dollar of revenue earned in a sector).
Score 5		3b	Outstanding amount in the company is known. Emission factors for the sector per unit of asset (e.g., tCO2 e per euro or dollar of asset in a sector) are known.
		3c	Outstanding amount in the company is known. Emission factors for the sector per unit of revenue (e.g., tCO2 e per euro or dollar of revenue earned in a sector) and **asset turnover ratios** for the sector are known.

A detailed summary of the data quality score table, including data needs and equations to calculate financed emissions, is provided in Annex 10.1 (Table 10.1-2). Data for all three options in Table 5.2-1 can be derived from different data sources.

[86] For business loans to listed companies, total company equity and debt is defined as the EVIC of the respective company.
[87] The quality scoring for the Option 2a is only possible for/applicable to scope 1 and scope 2 emissions as scope 3 emissions cannot be estimated by this option. Other options can be used to estimate the scope 3 emissions, however.
[88] If revenue is not deemed a suitable financial indicator for estimating the emissions of a company in a certain sector, one can apply other suitable financial indicators as a proxy. If an alternative indicator is used, the reasoning for the selection of this alternative indicator should be made transparent. The data quality score will not be affected.

Data providers (Option 1)

For Option 1 (reported emissions), PCAF recommends either collecting emissions from the borrower or investee company directly (e.g., company sustainability report) or third-party data providers, such as CDP, Bloomberg, MSCI, Sustainalytics, S&P/Trucost, and ISS ESG. Data providers typically make scope 1 and 2 emissions data available. PCAF encourages using the most recent available data and to mention the data source, reporting period, or date of publication.

Data providers collect emissions data as reported by the companies themselves, either through a standardized framework such as CDP or through a company's own disclosures in official filings and environmental reports. They often have their own methodologies to estimate/calculate companies' emissions, especially if emissions are not reported. In this case, the calculation would be in line with Options 2 or 3, assuming the methodology used is in line with the GHG Protocol. Financial institutions should ask data providers to be transparent, disclose the calculation method they use, and confirm alignment with the GHG Protocol. This will enable financial institutions to apply the proper score to the data. PCAF also encourages data providers to apply the PCAF scoring method to their own data, which would allow them to share the data quality scores directly with their clients.

PCAF does not recommend a preferred data vendor. PCAF recommends using data providers that use the standardized CDP framework and suggests data providers disclose the data quality score according to the scoring hierarchy in Table 5.2-1.[89] When using data providers, PCAF recommends using the same provider due to the variability of scope 1 and 2 emissions observed by providers.

Estimation models (Option 2 and 3)

Not all companies disclose their emissions data in official filings or through data providers. Reporting in emerging markets often lags that of developed markets. To maximize the coverage of emissions data, the remaining gaps are often filled with estimates.

For Option 2 (physical activity-based emissions), PCAF recommends using actual energy consumption (e.g., megawatt-hours of natural gas consumed) or production (e.g., tons of steel produced) data reported by companies, given the data fully covers the company's emissions-generating activities. The emission factors expressed per physical activity used should be based on appropriate and verified calculation methodologies or tools issued or approved by a credible independent institution. Example data sources for retrieving emission factors are ecoinvent,[90] Defra,[91] IPCC,[92] GEMIS,[93] and FAO.[94] The most recent available data should be used, including a mention of the data source, reporting period, or publication date.

For Option 3 (economic activity-based emissions), PCAF recommends using official statistical data or acknowledged EEIO tables providing region- or sector-specific average emission factors expressed per

[89] More information about CDP can found at: https://www.cdp.net/en
[90] More information can be found at: https://www.ecoinvent.org/
[91] More information can be found at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021
[92] More information can be found at: https://www.ipcc-nggip.iges.or.jp/EFDB/find_ef.php
[93] More information can be found at: http://iinas.org/gemis-download.html
[94] More information can be found at: http://www.fao.org/partnerships/leap/database/ghg-crops/en

economic activity (e.g., tCO2 e/€ or $ of revenue or tCO2 e/€ or $ of sectoral assets). Financial institutions should use emission factors that are as consistent as possible with the primary business activity financed.[95] For example, for a business loan to a paddy rice farmer, the financial institution should seek to find and use a sector-specific average emission factor for the paddy rice sector and not an emission factor for the agricultural sector in general. Also, for loans to other financial institutions (if PCAF-aligned reported numbers are not available) the financed scope 3 category 15 emissions can be estimated based on a data quality score 5 approach. This may involve assessing the sectoral distribution of the financial institution, receiving the loan and applying appropriate emission factors from EEIO databases. If sectoral breakdowns are unavailable, the financed scope 3 category 15 emissions can be estimated by applying an economy-wide average emission factor to the total portfolio value.

Example EEIO databases that can be used to obtain such emission factors are EXIOBASE,[96] CEDA,[97] GTAP,[98] or WIOD.[99] PCAF's web-based emission factor database provides a large set of emission factors for Option 2 and Option 3 above. The database, which is currently available only to PCAF signatories, can help financial institutions get started with estimating the financed emissions of their investments.

PCAF expects that the financed emissions for most listed equity and corporate bonds can be derived through either reported emissions (Option 1), physical activity data (Option 2), or economic activity data (Option 3). If none of the specified options are applicable, PCAF allows the use of alternative options to calculate emissions. For example, if PCAF-aligned reported numbers are not available, financed scope 3 category 15 emissions can be estimated based on a data quality score 5 approach. This may involve assessing the portfolio's sectoral distribution and applying appropriate emission, such as EEIO databases. If sectoral breakdowns are unavailable, the financed scope 3 category 15 emissions can be estimated by applying an economy-wide average emission factor to the total portfolio value. Any deviation from the specified options shall be accompanied by an explanation from the reporting financial institution.

Emission removals

Companies in an FI's portfolio should report on emission removals, whether nature- or technology-based,[100] as part of their GHG reporting. Reporting should follow existing GHG Protocol guidance, and emission removals shall be reported separately from both absolute emissions and any carbon credits retired and generated.

Carbon credits generated by companies should be reported and carbon credits retired may be reported. These figures can provide transparency and context for the financed emissions and removals. Ultimately, the goal of the PCAF Financed Emissions Standard is to transparently report the total emissions impacts of lending and investments, not diluted by credits retired or generated.

---

[95] For conglomerates, financed emissions from a mix of activities can be estimated if data (e.g., revenue split) is available. If not, the primary revenue-generating activity should be chosen.
[96] More information can be found at: https://www.exiobase.eu
[97] More information can be found at: https://watershed.com/solutions/ceda
[98] More information can be found at: https://www.gtap.agecon.purdue.edu
[99] More information can be found at: http://www.wiod.org
[100] Note that new GHG Protocol guidance is being developed on accounting for land sector activities and CO_2 removals in corporate GHG inventories, building on the Corporate Standard and Scope 3 Standard. Draft guidance for this is expected in 2022. Where necessary, the PCAF Global Standard will be updated in line with the final version of the new GHG Protocol guidance

FIs can calculate attribution of companies' reported emission removals using the existing attribution logic set out in this chapter (see formula below); this same logic applies to any attribution of companies' reported credits retired or generated.

$$Emission\ removals = \sum_{c} \frac{Outstanding\ investment_c}{(EVIC\ or\ Total\ company\ equity + debt)_c}\ x\ Company\ emission\ removals_c$$

(with c = borrower or investee company)

Example accounting – a portfolio of different companies

An FI invests into multiple companies with different emissions profiles as illustrated in the following table. All numbers are in tCO_2e e for the reporting year 2020 and are dummy data for the purpose of this example.

Table 5.2-2: Example of data input for calculating a portfolio of different companies

	Scope 1	Scope 2	Scope 3	Emission removals	Carbon credits retired	Carbon credits generated	Attribution factor
Forestry company	1,000	100	5,000	20,000	0	5,000	10%
Industrial company	20,000	5,000	30,000	0	25,000	0	25%
Energy company	5,000	0	10,000	1,000	5,000	500	20%

The portfolio contains a forestry company that sells carbon credits based on its forestry activities, an industrial company that buys carbon credits based on forestry activities, and a green energy company that builds renewable energy plants combined with afforestation activities. The FI would report aggregated numbers for this portfolio per the table below. This table sums the attributed emissions and credits of the forestry, industrial, and energy companies from the table above. Note that reporting carbon credits retired by clients is optional.

Table 5.2-3: Calculation example portfolio of different companies

Based on companies in above table	Calculation	Total portfolio number
Scope 1 – Absolute emissions	1,000 x 10% + 20,000 x 25% + 5,000 x 20%	6,100
Scope 2 – Absolute emissions	100 x 10% + 5,000 x 25%	1,260
Scope 3 – Absolute emissions	5,000 x 10% + 30,000 x 25% + 10,000 x 20%	10,000
Emission removals	20,000 x 10% + 1,000 x 20%	2,200
Carbon credits retired	25,000 x 25% + 5,000 x 20%	7,250
Carbon credits generated	5,000 x 10% + 500 x 20%	600

FIs may further subdivide these overall reporting categories into subcategories. For example, carbon credits retired may be further reported separately by specific type of credit (e.g., emissions "avoidance"

versus "removal")[101] or classified based on the credit standard (e.g., Verified Carbon Standard (VCS) or Gold Standard). The FI may choose to separately report 'net' numbers that display total absolute emissions minus total emission removals, for example. Nonetheless, for the purposes of this Financed Emissions Standard, the fundamental requirement is that reporting should at a minimum include separate numbers for absolute emissions and emission removals, in addition to any 'net' numbers.

Example tool to calculate emission removals – the FoRESt Carbon Sequestration (FRESCOS) Tool

FMO has been working with three other European development finance institutions (CDC, Finnfund, and Swedfund) and Finnish forestry expert Simosol to build an online tool to estimate the amount of carbon sequestered through plantation and agroforestry operations, called the FRESCOS Tool. The tool is built upon the IPCC Guidelines for National GHG Inventories and can be found at https://www.frescos.earth. While PCAF does not endorse the use of this tool specifically, the FRESCOS Tool is an example of a tool that can be used by FIs as a basis for calculating financed emission removals. The FRESCOS tool is open for other FIs and interested parties to use.

LIMITATIONS

Generalized nature of Option 3

One limitation of Option 3 is the generalized nature and necessary assumptions made in applying region- or sector-specific average values (both for emissions and financial data). This makes calculations less robust and more uncertain than those based on data specific to the borrower or investee, as the data for this option largely depends on assumptions and approximations derived from region and sector averages. In addition, statistical data or acknowledged EEIO tables for a given region need to be critically mapped to the sector classification used by the reporting financial institution, as the sectors may not map one-to-one and may cause financed emissions to be over- or understated in the end.

Measurement inconsistencies

Inconsistencies can arise from measuring part of the portfolio with borrower- or investee-specific emissions data (which may encompass scopes 1, 2, and 3 emissions) and from measuring the other part with region- or sector-specific average emissions data (which often encompasses only scope 1 and 2 emissions). One mitigating factor is that using borrower- or investee-specific emission data could improve the accuracy of the region- or sector-specific average data if the reporting financial institution had enough borrower- or investee-specific data points relative to the size of the portfolio in a given sector. For example, if a majority of the borrowers in a lender's textile manufacturing loan portfolio provide specific emissions data, these averages could be applied (instead of industrywide sector averages) to the remainder of the borrowers in the sector that did not provide specific emissions data.

Timing of emissions

Another limitation of the described options stems from the use of year-end outstanding balances. For a portfolio that includes loans and equity investments to businesses in industries with high seasonal variability or temporal volatility, using year-end outstanding balances may not capture the activity

[101] Reporting around the use of carbon offsets may need to evolve because it does not yet consistently distinguish between avoidance and removal offsets.

occurring during seasons that do not overlap with the end of the year. Similarly, reporting financial institutions using different fiscal calendars may be less comparable with each other. A solution could be that financial institutions opt to conduct GHG accounting using an average monthly balance for the year instead of a year-end balance. However, this would put more burden on the reporting financial institutions. If financial institutions decide to apply such average monthly balances, they should report these results separately and make the method and assumptions transparent.

Market value fluctuations

When using EVIC as the denominator for business loans to listed companies, assets under management change as a result of fluctuating market prices. Under the influence of this fluctuation, an objective to reduce relative financed emissions (also referred to as emission intensities) by a certain percentage becomes a moving target. Using normalized assets under management may help overcome this, as prices are held constant over the target period. For example, the EU TEG and EU regulation on benchmarks require the application of an inflation correction to changes in EVIC over time.

Applying corrections for market price fluctuations can highly influence the results and heavily reduce the comparability of results between different financial institutions when applied inconsistently. In addition, corrections could theoretically be applied to many other variables (like exchange rates, inflation, emerging versus emerging markets, etc.), further reducing comparability. For that reason, PCAF requires all financial institutions to report their uncorrected absolute emissions as a minimum. Corrected results may optionally be reported separately. If the financial institution decides to apply such adjustments, they should be made transparent. In the future, PCAF will also investigate the challenges linked to steering on financed emissions and describe the metrics in use by investors as emerging practices.

Project finance

PCAF®
Partnership for
Carbon Accounting
Financials

5.3 Project finance

ASSET CLASS DEFINITION

This asset class includes all on-balance sheet loans or equities to projects or activities that are designated for specific purposes, i.e., with known use of proceeds as defined by the GHG Protocol. The financing is designated for a defined activity or set of activities, such as the construction and operation of a gas-fired power plant, a wind or solar project, or energy efficiency projects.

EMISSION SCOPES COVERED

Financial institutions **shall** report the absolute scope 1 and 2 emissions of the project. Scope 3 emissions should be covered if relevant.[102] Removed emissions **may** be reported if relevant but **shall** be reported separately from absolute emissions.

In previous editions of the Financed Emissions Standard, the Project Financed asset class included guidance on estimating avoided emissions from specific renewable energy projects. Beginning with this Third Edition (December 2025), avoided emissions are no longer covered in this Standard. Financial institutions seeking guidance on estimating avoided emissions can refer to PCAF's Financed Avoided Emissions and Forward-looking Metrics guidance. This optional resource expands on previous guidance and offers a structured approach for estimating and disclosing financed avoided emissions (beyond renewable energy only[103]).

ATTRIBUTION OF EMISSIONS

As a basic attribution principle, the financial institution accounts for a portion of the annual emissions of the financed project. This portion is determined by the attribution factor, which is the ratio between the institution's outstanding amount (numerator) and the total equity and debt of the financed project (denominator).[104]

$$Attribution\ factor_p = \frac{Outstanding\ investment_p}{Total\ equity + debt_p}$$

For equity, the outstanding amount is calculated as follows:

$$\frac{\#\ shares\ of\ financial\ institution_p}{total\ shares_p}\ x\ total\ equity_p$$

(with p=project)

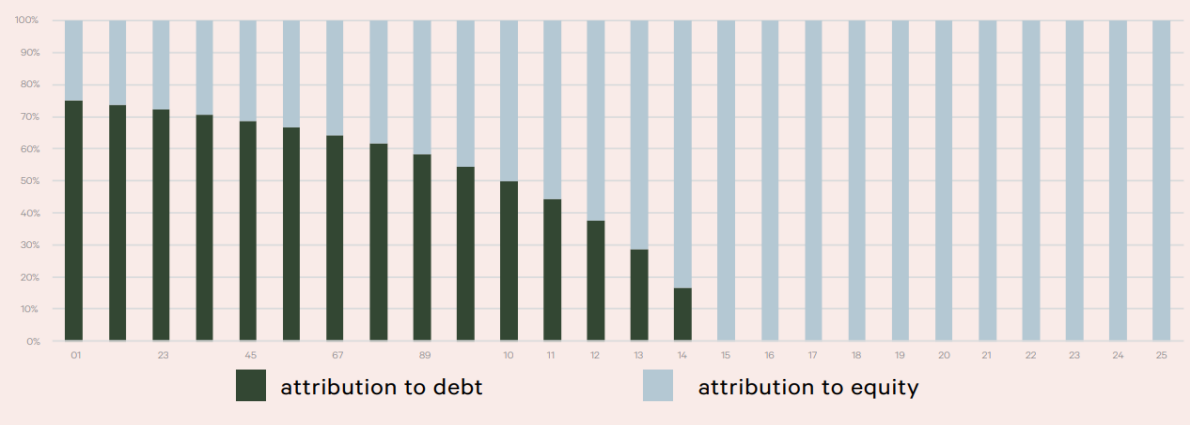
[102] Examples of projects where scope 3 emissions are relevant include but are not limited to nuclear power plants, hydroelectric power plants, infrastructure projects (airports, highways), and oil and gas exploration.
[103] Please note, this supplemental guidance does not include renewable energy-specific calculation guidance. Financial institutions can refer to earlier editions of the Standard for that information.
[104] The attribution factor calculation is, in principle, only possible for project finance where project-specific financial data is available. For project finance where such data is unavailable, the attribution factor cannot be calculated but rough estimations on attribution can still be made based on region- and sector-specific average financial data and the outstanding amount. This is explained in more detail in the "Equations to calculate financed emissions" and "Data required" sections below (see Option 3b and Option 3c).

The outstanding amount in the numerator is the amount of debt or equity provided by the individual financier. In the case of debt, the outstanding amount is defined as the value of the debt the borrower owes to the lender (i.e., disbursed debt minus any repayments[105]). In the case of equity, the outstanding amount is the outstanding value of equity the financial institution holds in the project. It is calculated by multiplying the relative share of the financial institution in the respective project[106] by the total equity of the respective project according to its balance sheet. Guarantees have no attribution until they are called and turned into a loan. Financial institutions should either use the calendar or financial year-end outstanding amount, provided the approach is communicated and used consistently.

At the start of the project, the total equity[107] and debt[108] in the denominator is the total financing available for the project (total debt plus equity to realize the project).[109] In subsequent years, it is expected that projects will report annually on their financials, including balance sheet information, i.e., the total equity and debt within the project. The value of total equity and debt in the denominator can then be used to calculate the attribution factor.

Figure 5.3-1 illustrates the attribution rule, where initially most of the emissions from the project are attributed to debt, but as debt is repaid more and more of the emissions become attributable to the equity providers.

Figure 5.3-1. Illustration of changes in equity/debt attribution over time



[105] It should be emphasized that the outstanding of a debt position does not include interest accrued by the borrower. This value should only represent the amount disbursed by the financial institution minus any repayments on the principal because this more accurately reflects the impact of the loan in the real economy.
[106] The relative share of the financial institution in the respective project is calculated by dividing the number of shares the financial institution holds in the respective project by the total number of shares of the investee.
[107] In cases where the total project equity value according to the project's balance sheet is negative, the financial institution shall set total equity to 0; this means that all emissions are attributed to debt only, while no emissions are attributed to equity investments. This can happen when the retained earnings are negative while at the same time being higher than the other equity components on the balance sheet of the project. By this approach, for those projects that are doing well (i.e., they have high retained earnings), financial institutions attribute more emissions to equity providers; for those projects doing poorly (i.e., they have high retained losses), financial institutions attribute more emissions to debt providers. This is in line with the attribution factor rationale for listed companies, where the equity part of EVIC (i.e., market capitalization) also implicitly reflects retained earnings and losses (e.g., if retained earnings increase, the share price and market capitalization generally also increase).
[108] Total debt includes both current and long-term debt on the balance sheet.
[109] If total debt or total equity cannot be obtained from a project's balance sheet for whatever reason (e.g., for some it might be difficult to obtain these values), financial institutions are allowed to fall back to the total balance sheet value (i.e., the sum of total equity and liabilities, which is equal to the project's total assets) with the intention of improving this data quality in the future.

Accounting for projects without a separate balance sheet

The attribution methodology for this asset class presupposes, in principle, that a separate balance sheet is available for the project, which usually requires that the project needs to be financed via a separate legal entity (e.g. a special purpose vehicle). In this case the legal entity can be considered a separate use of proceeds structure (UoP) structure with control over the project as the sole underlying asset, which based on the Use of Proceeds Structures method is accounted in line with the Project Finance asset class.

However, projects can also be financed without a separate balance sheet. This happens when a project is financed via a debt-based integrated use of proceeds structure and is particularly common for energy efficiency projects. Some examples are:

- Project to replace fluorescent lights with LEDs in buildings.
- Project to install a new boiler to upgrade a production line in a manufacturing plant.

In this case, the total debt in a project might be clear at origination but is difficult or impossible to monitor afterwards. If no information is available on total debt, the default attribution methodology in this asset class cannot be applied.

In line with the 'follow the money' approach, this section allows financed emissions accounting for projects without a separate balance sheet under the requirement that the emissions of the project can be defined independently. This means that the project activities are independent enough from the overarching entity for emissions to be allocated to the project. For example:

- Project replaces fluorescent lights with LEDs. The electricity use of the LEDs can be estimated.
- Project installs a new boiler. The fuel use of the boiler can be measured.

When the emissions can be defined independently and total debt is not available, the following attribution factor **may** be used:

$$Attribution\ factor_p = \frac{Outstanding\ amount_p}{Total\ project\ value\ at\ origination_p}$$

The total project value is frozen at origination, i.e. the moment the investment is made. When the project value at origination is not feasible to obtain, financial institutions shall use the latest project value available and fix this value for the following years of GHG accounting, i.e., the denominator remains constant.

This accounting methodology **shall** only be applied if the emissions of the project can be defined independently. If this no longer applies, emissions **shall** be calculated and attributed based on the financing share in the issuer or overarching entity, e.g. the whole manufacturing plant.

EQUATIONS TO CALCULATE FINANCED EMISSIONS

The financed emissions from a single project are calculated by multiplying the attribution factor by the emissions of the respective project. The total financed emissions from multiple projects are calculated using the following equation:

$$Financed\ emissions = \sum_{p} Attribution\ factor_p\ x\ Project\ emissions_p$$

(with p=project)

In this asset class, the sum represents all projects in a financial institution's portfolio, and the attribution factor represents the proportional share of a given project—that is, the ratio of the outstanding amount to total equity and debt:

$$Financed\ emissions = \sum_{p} \frac{Oustanding\ amont_p}{Total\ equity + debt_p}\ x\ Project\ emissions_p$$

(with p=project)

Overall, PCAF distinguishes three different options to calculate project emissions depending on the availability of project-specific data:

- Option 1: reported emissions, where verified[110] or unverified[111] emissions are collected from the project directly or indirectly through independent third parties.
- Option 2: physical activity-based emissions, where emissions are estimated based on primary physical activity data collected from the project (e.g., fuel consumed or megawatt-hours of electricity produced). The emissions data should be estimated using an appropriate calculation methodology or tool with verified emission factors expressed per physical activity (e.g., tCO_2e/MWh) issued or approved by a credible independent body such as the International Energy Agency (IEA).
- Option 3: economic activity-based emissions, where emissions are estimated based on economic activity data collected from the project (e.g., revenue or assets). The emissions data should be estimated using official statistical data or acknowledged EEIO tables providing region- or sector-specific average emission factors expressed per economic activity (e.g., tCO_2e/€ of revenue or tCO_2e/€ of asset).[112]

DATA REQUIRED

Within the due diligence and monitoring of a project finance transaction, the availability and quality of project-specific data is generally good. Project-specific reported emissions (Option 1) ranks highest in

[110] This refers to reported emissions being calculated in line with the GHG Protocol and verified by a third-party auditor.
[111] This refers to reported emissions being calculated in line with the GHG Protocol without verification by a third-party auditor. Unverified reported emissions can be calculated by either an external party or by the borrower or investee itself.
[112] Sampling tests based on actual data on the company level extrapolated to the portfolio level can help to test the accuracy of calculations based on this data from statistics or EEIO tables. This may also be used to refine the data for specific sectors or regions if the reporting financial institution has a strong presence in and specific knowledge of the respective sector or region. National agencies and regional data providers or statistical offices in individual regions may assist reporting financial institutions and borrower or investee companies in various regions in finding regional and more relevant financial or emissions data information.

quality and consistency but will not always be available. Physical activity-based data (Option 2) such as megawatt-hours produced is generally available from a previous year or as an estimate (e.g., P50 estimations for renewable energy projects).[113] The lowest data quality applies when there is no project-specific physical data and only financial data is available (Option 3).

The data quality scorecard in Table 5.3-1 is recommended for project finance. Financial institutions can refine or further specify this generic data quality table per project type, as long as these refined data quality tables are disclosed transparently.

Table 5.3-1. General description of the data quality score table for project finance

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

Data Quality	Options to estimate the financed emissions		When to use each option
Score 1	Option 1: Reported emissions	1a	Outstanding amount in the project and total project equity plus debt are known. **Verified emissions** of the project are available.
Score 2		1b	Outstanding amount in the project and total project equity plus debt are known. **Unverified emissions** reported by the project are available.
	Option 2: Physical activity-based emissions	2a[114]	Outstanding amount in the project and total project equity plus debt are known. Project emissions are not known but calculated using primary physical activity data for the project's energy **consumption** and emission factors[115] specific to that primary data. Relevant process emissions are added.
Score 3		2b	Outstanding amount in the project and total project equity plus debt are known. Project emissions are not known. Emissions are calculated using primary physical activity data for the project's **production**[116] and emission factors specific to that primary data.
Score 4	Option 3: Economic activity-based emissions	3a	Outstanding amount in the project, total project equity plus debt, and the **project's revenue**[117] are known. Emission factors for the sector per unit of revenue or from similar projects is known (e.g., tCO_2e per euro or dollar of revenue earned in a sector).
Score 5		3b	Outstanding amount in the project is known. Emission factors for the sector per unit of asset or economic activity-based emission factors from similar projects (e.g., tCO_2e per euro or dollar of asset in a sector) are known.
		3c	Outstanding amount in the project is known. Emission factors for the sector per unit of revenue (e.g., tCO_2e per euro or dollar of revenue earned in a sector) and **asset turnover ratios** for the sector or from similar projects are known.

[113] For renewable energy projects it is customary to have experts calculate percentile production predictions based on an analysis of historic data resource data (wind, irradiation, hydraulic flow, etc.). The P50 value is the predicted annual production for which there is a 50% probability it will be exceeded in a given year. The P90 value is the predicted value that has a 90% probability of being exceeded in a given year (the 1-year P90) or of being exceeded in an average year over a 10-year period (the 10-year P90). PCAF proposes using the P50 predicted production.
[114] The quality scoring for the Option 2a is only possible for/applicable to scope 1 and scope 2 emissions as scope 3 emissions cannot be estimated by this option. Other options can be used to estimate the scope 3 emissions, however.
[115] Supplier-specific emission factors (e.g., from an electricity provider) for the respective primary activity data are always preferred over non-supplier-specific emission factors.
[116] Production can refer to both the production of physical outputs such as steel as well as the production of electricity.
[117] If revenue is not deemed a suitable financial indicator for estimating the emissions of a project, one can apply other suitable financial indicators as a proxy. If an alternative indicator is used, the reasoning for the selection of this alternative indicator should be made transparent. The data quality score will not be affected.

A detailed summary of the data quality score table, including data needs and equations to calculate financed emissions, is provided in Annex 10.1 (Table 10.1-3).

PCAF expects that the financed emissions for most projects can be derived through either reported emissions (Option 1), physical activity data (Option 2), or economic activity data (Option 3).

EMISSION REMOVALS

Emission removals can be relevant for project finance. Sequestered emissions (which is one form of emission removals) account for carbon sinks where carbon is absorbed from the atmosphere. Projects in an FI's portfolio should report on emission removals, whether nature- or technology based,[118] as part of their GHG reporting. Reporting should follow existing GHG Protocol guidance, and emission removals shall be reported separately from both absolute emissions and any carbon credits retired and generated.

Carbon credits generated by projects should be reported and carbon credits retired may be reported. These figures can provide transparency and context for the financed emissions and removals. Ultimately, the goal of the PCAF Financed Emissions Standard is to transparently report the total emissions impacts of lending and investments, not diluted by credits retired or generated.

FIs can calculate attribution of projects' reported emission removals using the existing attribution set out in this chapter (see formula below); this same logic applies to any attribution of projects' reported credits retired or generated.

$$Emission\ removals = \sum_{p} \frac{Outstanding\ investment_p}{Total\ project\ equity + debt_p}\ x\ Project\ emission\ removals_p$$

(with p=project)

Example accounting – a portfolio of different projects

An FI invests into multiple projects with different emissions profiles as illustrated in the following table. All numbers are in tCO_2e for the reporting year 2020 and are dummy data for the purpose of this example.

[118] Note that new GHG Protocol guidance is being developed on accounting for land sector activities and CO_2 removals in corporate GHG inventories, building on the Corporate Standard and Scope 3 Standard. Draft guidance for this is expected in 2022. Where necessary, the PCAF Global Standard will be updated in line with the final version of the new GHG Protocol guidance.

Table 5.3-2: Example of data input for calculating a portfolio of different companies

	Scope 1	Scope 2	Scope 3	Emission removals	Carbon credits retired	Carbon credits generated	Attribution factor
Forestry company	1,000	100	5,000	20,000	0	5,000	10%
Industrial company	20,000	5,000	30,000	0	25,000	0	25%
Energy company	5,000	0	10,000	1,000	5,000	500	20%

The portfolio contains a forestry company that sells carbon credits based on its forestry activities, an industrial company that buys carbon credits based on forestry activities, and a green energy company that builds renewable energy plants combined with afforestation activities. The FI would report aggregated numbers for this portfolio per the table below. This table sums the attributed emissions and credits of the forestry, industrial, and energy companies from the table above. Note that reporting carbon credits retired by clients is optional.

Table 5.3-4: Calculation example portfolio of different companies

Based on companies in above table	Calculation	Total portfolio number
Scope 1 – Absolute emissions	1,000 x 10% + 20,000 x 25% + 5,000 x 20%	6,100
Scope 2 – Absolute emissions	100 x 10% + 5,000 x 25%	1,260
Scope 3 – Absolute emissions	5,000 x 10% + 30,000 x 25% + 10,000 x 20%	10,000
Emission removals	20,000 x 10% + 1,000 x 20%	2,200
Carbon credits retired	25,000 x 25% + 5,000 x 20%	7,250
Carbon credits generated	5,000 x 10% + 500 x 20%	600

FIs may further subdivide these overall reporting categories into subcategories. For example, carbon credits retired may be further reported separately by specific type of credit (e.g., emissions "avoidance" versus "removal")[119] or classified based on the credit standard (e.g., Verified Carbon Standard (VCS) or Gold Standard). The FI may choose to separately report 'net' numbers that display total absolute emissions minus total emission removals, for example. Nonetheless, for the purposes of this Financed Emissions Standard, the fundamental requirement is that reporting should at a minimum include separate numbers for absolute emissions and emission removals, in addition to any 'net' numbers.

[119] Reporting around the use of carbon offsets may need to evolve because it does not yet consistently distinguish between avoidance and removal offsets.

Example tool to calculate emission removals – the FoRESt Carbon Sequestration (FRESCOS) Tool

FMO has been working with three other European development finance institutions (CDC, Finnfund, and Swedfund) and Finnish forestry expert Simosol to build an online tool to estimate the amount of carbon sequestered through plantation and agroforestry operations, called the FRESCOS Tool. The tool is built upon the IPCC Guidelines for National GHG Inventories and can be found at https://www.frescos.earth. While PCAF does not endorse the use of this tool specifically, the FRESCOS Tool is an example of a tool that can be used by FIs as a basis for calculating financed emission removals. The FRESCOS tool is open for other FIs and interested parties to use.

LIFETIME EMISSIONS

Portfolio accounting of emissions occurring in the reporting year does not consider lifetime emissions insofar as these emissions happen before or after the reporting year. For example, emissions related to future disposal of a wind park are not reported in the current reporting year.

Nevertheless, this principle is problematic for construction projects. For example, in the case of a gas-fired power plant, construction emissions would be accounted during the construction phase and operational emissions during the operational phase. However, if the loan is repaid shortly after operation starts, the portfolio emissions for that investment would only reflect a small portion of the total emissions impact created during the lifetime of that gas-fired power plant.

As the power plant is often constructed by a third party (i.e., a construction company) contracted by the project developer, the emissions of the construction and purchased goods and services are normally reported under scope 3 of the project developer. These scope 3 emissions are usually not significant enough to report or they might be unavailable, in which case no emissions will be reported. When these scope 3 emissions are relevant, they should be reported.

To address the above, a financial institution should, if they are an initial sponsor or lender, assess the total projected lifetime scope 1 and 2 emissions for projects that were financed during the reporting year. Those emissions should be reported separately in the year of contracting. If a financial institution would be an initial lender for the above example of a gas-fired power plant, it should report in the year of contracting the total projected lifetime scope 1 and 2 emissions based on the installed capacity of the plant, the expected load factor of the plant, the expected lifetime of the plant, and the expected carbon content of the gas used.

PORTFOLIO VS. (ANNUALIZED) LIFETIME EMISSIONS

Various (multilateral) development banks have been working on harmonizing GHG accounting of new projects under the IFI Framework for a Harmonized Approach to Greenhouse Gas Accounting.[120] These financial institutions developed a methodology to calculate the expected emissions of newly signed

[120] (UNFCCC, 2015). Additional information can be found at: https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting

contracts for specific projects in the reporting year.[121] In the IFI methodology, avoided emissions are assessed using emission factors (called combined margin) that incorporate future greening of the electricity grid. These avoided emissions are annualized and reported in the year of loan/equity origination.

Unlike the IFI methodology, PCAF's portfolio GHG accounting involves calculating the annual emissions linked to the financial institution's balance sheet and using emission factors (operating margin) that are based on the existing fossil fuel power plants in a country or region whose operation will be most affected (reduced) by the project.

PCAF considers portfolio and (annualized) lifetime GHG accounting to be complementary. Portfolio GHG accounting better lends itself to target setting compared to a global carbon budget, whereas (annualized) lifetime GHG accounting can be used to reflect the generated emissions or avoided emissions over the operational lifetime. Portfolio GHG accounting is more suited to guide strategic developments on a portfolio level, while lifetime GHG accounting can be used to make investment-level decisions (e.g., to avoid investments with carbon lock-in).

[121] The emission factors can be found at: https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-forghg-accounting/ifi-twg-list-of-methodologies

Commercial real estate

PCAF®
Partnership for Carbon Accounting Financials

5.4 Commercial real estate

ASSET CLASS DEFINITION

This asset class includes on-balance sheet loans for specific corporate purposes, namely the purchase and refinance of commercial real estate (CRE), and on-balance sheet investments in CRE when the financial institution has no operational control over the property. This definition implies that the property is used for commercial purposes, such as retail, hotels, office space, industrial, or large multifamily rentals. In all cases, the owner of the building uses the property to conduct income-generating activities.

In case of no operational control, CRE investments by asset owners are also included in this method. These investments consist of deals where the asset owner partially owns the building in a joint venture, joint operation, or in joint ownership, but doesn't have the full authority to introduce and implement operating policies at the property.

CRE investments listed in the stock market are classified as listed equity. In this case, financial institutions shall use the method for Listed Equity and Corporate Bonds (subchapter 5.1).

Loans secured by CRE for other purposes than CRE and loans to CRE companies are classified as business loans if the loans are for general corporate purposes (i.e., with unknown use of proceeds as defined by the GHG Protocol). In these cases, financial institutions shall use the method for Business Loans and Unlisted Equity (subchapter 5.2).

Loans for construction and renovation of CRE are optional. As the building is often constructed by a third party (i.e., a construction company) contracted by the project developer, the emissions of the construction are normally reported under scope 3 of the project developer during the building's construction phase. As such, it can be impractical for the lender to measure the financed emissions of a construction or renovation loan unless the project developer reports construction emissions. The following section on emission scopes covered provides further explanation.

EMISSION SCOPES COVERED

For property already built, financial institutions shall cover the absolute scope 1 and 2 emissions related to the energy use of financed buildings during their operation. Energy use includes the energy consumed by the building's occupant and shared facilities.

Reporting financed emissions from construction or renovation of buildings is optional. When measuring these emissions, financial institutions should refer to the GHG Protocol's guidance to account for construction emissions.[122] If the property developer (i.e., the investee) measures and reports construction emissions, financial institutions should account for the related financed emissions during the building's construction phase. These emissions would typically be considered scope 3, category 15: investments,

[122] (ENCORD, 2012)

from the financial institution's perspective. If the investee reports construction emissions as part of its own scope 3 inventory, these may fall under scope 3, category 11: use of sold products, depending on the nature of the developer's business.

If the property developer does not measure and report construction emissions, financial institutions are encouraged to engage with them to promote the practice. Encouraging investees to report scope 3 emissions, particularly those related to construction, supports broader efforts to improve transparency and completeness in financed emissions reporting.

While reporting financed construction emissions is not yet required, PCAF acknowledges that construction emissions, notably building's embodied GHG emissions, are important and should not be neglected. PCAF will continue to monitor guidance developments[123] on the subject. When robust approaches and data to measure the embodied emissions of buildings are available, PCAF could expand its coverage to include these emissions.

ATTRIBUTION OF EMISSIONS

When calculating the financed emissions, a building's annual emissions are attributed based on the ratio between the outstanding amount and the property value at the time of loan or equity origination. This ratio is called the attribution factor:

$$Attribution\ factor_b = \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}$$

(with b=building)

For loan providers, the numerator is the outstanding loan amount,[124] whereas for investors, it is the outstanding investment amount. In both cases, the outstanding amount is the value of the loan or investment on the financial institution's balance sheet.

When the property value at loan or equity origination is not feasible to obtain, financial institutions shall use the latest property value available and fix this value for the following years of GHG accounting, i.e., the denominator remains constant from the first year of GHG accounting onward.[125] The property value should include the value of the land, the building, and any building improvements. When a CRE loan is modified (e.g., loan amount is increased, renewed, refinanced, or extended) and a new property value is obtained as part of the transaction, the property value at origination shall be updated to the property value at the time of the modification.

[123] For example, the World Business Council for Sustainable Development (WBCSD) is working on creating an approach for the embedded carbon of constructions. At this point, they are defining a theoretical approach with a working group consisting of real estate developers, building material producers, construction companies, and technical consultants. The key in this approach is to use a life cycle assessment to obtain average values of embedded carbon per square meter of building, which will differ per climate zone and building typology.

[124] For loan providers, the outstanding amount in the numerator is defined as the value of the debt that the borrower owes to the lender (i.e., disbursed debt minus any repayments). It will be adjusted annually to reflect the correct exposure, resulting in the attribution to decline to 0 at the end of the lifetime of the loan (i.e., when it is fully repaid).

[125] Availability of property value at origination varies by country. In some countries, financial institutions can easily retrieve the property value at origination from their books and do not typically update it to the current property value. In other countries, regulators require financial institutions to update the property value year over year.

When asset owners invest in CRE, they either fully finance the property or partially finance it through joint ventures, joint operation, or in joint ownership with other asset owners. When CRE is fully financed by an asset owner and the asset owner doesn't have operational control over the building, 100% of the building's emissions are attributed to the asset owner's financed emissions. When CRE is jointly financed by a group of asset owners, the attribution is based on the share invested by each asset owner.

EQUATIONS TO CALCULATE FINANCED EMISSIONS

Financed emissions of a CRE loan or investment are calculated by multiplying the attribution factor by the emissions of the building. Thus, financed emissions are calculated as follows:

$$Financed\ emissions = \sum_{b} Attribution\ factor_b\ x\ Building\ emissions_b$$

(with b=building)

The emissions of buildings are calculated as the product of a building's energy consumption and specific emission factors for each source of energy consumed. The total energy use of the building includes the energy consumed by the occupants of the building.

$$Financed\ emissions = \sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Energy\ consumption_{b,e}\ x\ Emission\ factor_e$$

(with b=building and e=energy source)

DATA REQUIRED

Actual building energy consumption is preferred but may not be widely available. In the absence of metered data, energy use can be estimated based on building characteristics and publicly available data.

Various sources and commercial databases are available and divide energy consumption by characteristics like energy label, type of property, and floor area of property. When applying these data on a large sample of financed properties, it is possible to get a reasonable approximation of the emissions. Similarly, supplier-specific emission factors[126] for specific energy sources should be used if they are available. If they are not, average emission factors[127] may be used. PCAF's web-based emission factor database provides emission factors by building type, floor area, and number of buildings for a large set of geographies. In March 2022, PCAF launched a publicly available database of emission factors for European buildings as part of its project, Financing towards net-zero buildings.

To improve building energy use estimation, financial institutions should collect data on building characteristics (e.g., size, building use, climate zone, and year constructed). Based on the data available, the following data hierarchy is proposed in order of preference:

[126] In the case of electricity, supplier-specific emission factors are the same as market-based emission factors.
[127] In the case of electricity, average emission factors, which are non-supplier-specific emission factors, are the same as location-based emission factors.

Table 5.4-1. General description of the data quality score table for CRE

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

Data Quality	Options to estimate the financed emissions		When to use each option
Score 1	Option 1: Actual building emissions	1a	Primary data on **actual building energy consumption** (i.e., metered data) is available. Emissions are calculated using actual building energy consumption and **supplier-specific emission factors**[128] specific to the respective energy source.
Score 2		1b	Primary data on **actual building energy consumption** (i.e., metered data) is available. Emissions are calculated using actual building energy consumption and **average emission factors** specific to the respective energy source.
Score 3	Option 2: Estimated building emissions based on floor area	2a	**Estimated building energy consumption per floor area based on official building energy labels**[129] **AND the floor area** are available. Emissions are calculated using estimated building energy consumption and **average emission factors** specific to the respective energy source.
Score 4		2b	**Estimated building energy consumption per floor area** based on building type and location-specific statistical data AND the floor area are available. Emissions are calculated using estimated building energy consumption and **average emission factors** specific to the respective energy source.
Score 5	Option 3: Estimated building emissions based on number of buildings	3	**Estimated building energy consumption per building based on building type and location-specific statistical data AND the number of buildings** are available. Emissions are calculated using estimated building energy consumption and **average emission factors** specific to the respective energy source

A detailed summary of the data quality score table, including data needs and equations to calculate financed emissions, is provided in Annex 10.1 (Table 10.1-4).

OTHER CONSIDERATIONS

Emission factors specific to energy source

Consumed energy can be converted to tCO_2e using emission factors. When converting building energy use to emissions, care should be taken to use emission factors that are appropriate to the energy type used in the building, e.g., electricity, natural gas, fuel oil, steam, etc. These factors should be specified according to the type of energy consumed.

[128] Supplier-specific emission factor is an emission rate provided by the energy supplier (e.g., utility) to its customers reflecting the emissions associated with the energy it provides (e.g., electricity, gas, etc.). Average emission factors represent the average emissions of the respective energy sources occurring in a defined boundary (e.g., national or subnational).

129 In jurisdictions where official energy labels are unavailable, financial institutions may rely on alternative labels or certificates that they determine to be equivalent in specificity and quality, for the purpose of achieving a comparable data quality score.

Building characteristics

Various building characteristics can be taken into consideration to provide additional resolution to average energy consumption and emissions when actual data is unavailable. Many countries conduct surveys to publicly provide building type and location-specific statistical data on average energy consumption by characteristics such as floor space,[130] principal building activity, region, number of floors, and year constructed. Other national surveys might provide tables on emissions and energy sources or end use by industry and region.

Where possible, the most common regional electricity grid mix data for the building's location should be used. If this is unavailable, country-level electricity grid mix emissions data should be used.

LIMITATIONS

Country-specific assumptions

Many countries lack widespread use of building energy labels, and it may be challenging for financial institutions to access a borrower's measured energy consumption data. As such, limited actual data will require financial institutions to estimate building energy use. Institutions may find that the data they have available in the existing portfolio requires using average values. Collecting additional building data at loan or investment origination may improve future estimations of energy use. Some municipal governments are collecting building energy data, and this could prove useful for some financial institutions.

Some country-specific adjustments will need to be made to make the calculation applicable depending on the data availability and standards in each country. The variations across countries in their systems of categorizing the energy efficiency of buildings require a tailored approach for optimal accuracy in calculations.

Property value

This Financed Emissions Standard requires financial institutions to use the property values determined at loan or equity origination in relation to the original value of the property. Thus, using the outstanding amount to the original value provides a consistent estimate of the proportion of the project attributable to the loan and investment. Nevertheless, PCAF recognizes that the availability of property value at loan or equity origination varies globally. In some countries, financial institutions can easily retrieve the property value at origination from their books and do not typically update it on an annual basis. In other countries, regulators require financial institutions to update property values annually.

Considering these differences, and to ensure as much consistency as possible in the calculations, when financial institutions do not have the property value at origination, they shall use the latest property value available. In addition, they shall fix this value for the following years of GHG accounting, i.e., the denominator remains constant from the first year of GHG accounting onward.

The property value includes the value of the land, the building, and any building improvements.

[130] When selecting an emission factor based on floor space, financial institutions should make sure that the unit of the emission factor matches the type of floor area, e.g., net floor area, usable floor, etc.

Mortgages

PCAF®
Partnership for
Carbon Accounting
Financials

5.5 Mortgages

ASSET CLASS DEFINITION

This asset class includes on-balance sheet loans for specific consumer purposes, namely the purchase and refinance of residential property, including individual homes and multifamily housing with a small number of units. This definition implies that the property is used only for residential purposes and not for commercial activities.

If the loan is used to refinance a mortgage and this loan is provided by the original mortgage provider, the new loan supersedes the original mortgage. If the refinancing is done by an institution other than the original loan provider, the new loan and associated building's emissions are attributed to the institution providing the loan for refinancing.

Home equity loans (HELs) and home equity lines of credit (HELOCs) are not required under this methodology given that these products are generally consumer loans for general consumer purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol.[131]

Mortgages used to construct or renovate a house are not required at this point, given that the homeowner does not directly account for construction emissions. As a home is often constructed or renovated by a third party (i.e., a home builder) contracted by the homeowner, the emissions of the construction would normally be accounted by the third party during the building's construction phase.[132]

Nevertheless, PCAF acknowledges that construction emissions, notably building's embodied GHG emissions, are important and should not be neglected. PCAF recommends financial institutions to find opportunities in the due diligence process to influence the homeowner into making low carbon choices. PCAF will continue to monitor guidance developments[133] on the subject. When robust approaches and data to measure the embodied emissions of buildings are available, PCAF could expand its coverage to include these emissions.

EMISSION SCOPES COVERED

Financial institutions shall cover the absolute scope 1 and 2 emissions related to the energy use of the property financed through the mortgage. Energy use includes the energy consumed by the building occupants. If the mortgage is used to purchase a multifamily home with shared facilities, scope 1 and 2 emissions of the whole property should be covered. If the mortgage is used to buy a single apartment or house, emissions related to the apartment or house should be covered.

---

[131] If the consumer loan is to purchase motor vehicles, financial institutions shall use the motor vehicle loans asset class method (subchapter 5.6).
[132] Theoretically, these emissions would be categorized under scope 3 of the homeowner, but in practice homeowners do not report emissions; thus, it is impractical for financial institutions to measure financed emissions of a construction or renovation mortgage.
[133] For example, the WBCSD is working on creating an approach for the embedded carbon of constructions. At this point, they are defining a theoretical approach with a working group consisting of real estate developers, building material producers, construction companies, and technical consultants. The key in this approach is to use a life cycle assessment to obtain average values of embedded carbon per square meter of building, which will differ per climate zone and building typology.

ATTRIBUTION OF EMISSIONS

When calculating financed emissions, a building's annual emissions are attributed to the mortgage provider using a loan-to-value approach. Thus, the attribution is equal to the ratio of the outstanding amount at the time of GHG accounting to the property value at the time of loan origination.

$$Attribution\ factor_b = \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}$$

(with b=building)

When the property value at loan origination is not feasible to obtain, financial institutions shall use the latest property value available and fix this value for the following years of GHG accounting, i.e., the denominator remains constant.[134]

The attribution approach assumes the residential property owner also takes ownership of the building's emissions.

EQUATIONS TO CALCULATE FINANCED EMISSIONS

Financed emissions of mortgages are calculated by multiplying the attribution factor by the emissions of the building. Thus, financed emissions are calculated as follows:

$$Financed\ emissions = \sum_b Attribution\ factor_b\ x\ Building\ emissions_b$$

(with b=building)

The emissions of buildings are calculated as the product of a building's energy consumption and specific emission factors for each source of energy consumed. The total energy use of the building includes the energy consumed by the building's occupant. The equation below is the result.

$$Financed\ emissions = \sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Energy\ consumption_{b,e}\ x\ Emission\ factor_e$$

(with b=building and e=energy source)

DATA REQUIRED

The availability of data on the energy consumption of properties is still limited in many countries; in others, it has improved considerably due to policy regulations within the built environment, such as the introduction of energy performance certificates and energy labels. In such countries, the available data is usually anonymized by averaging data over several households in the same peer group. Often, buildings'

[134] Availability of property value at loan origination varies by country. In some countries, financial institutions can easily retrieve the property value at loan origination from their books and do not typically update it to the current property value. In other countries, regulators require financial institutions to update the property value year over year.

energy data is available by energy label, type of household or sector, and type of property. When applying these data on many financed properties, it is possible to get a reasonable approximation of the emissions.

As more data sources become available, financial institutions are expected to move up the data hierarchy. Easily accessible data for many countries is currently between score 4 and 5 of the data quality score table provided below.

Some financial institutions may not collect information on property size, in which case they can use the average energy consumption by building and geographic region. Financial institutions should use the highest quality dataset available and evaluate new data sources on a regular basis.

Supplier-specific emission factors[135] for specific energy sources should be used if they are available. If they are not, average emission factors[136] may be used. PCAF's web-based emission factor database[137] provides emission factors by building type (e.g., single-family house and multifamily house), floor area, and number of buildings for a large set of geographies.

The following data hierarchy is proposed in order of preference:

[135] In the case of electricity, supplier-specific emission factors are the same as market-based emission factors.
[136] In the case of electricity, average emission factors, which are non-supplier-specific emission factors, are the same as location-based emission factors.
[137] The PCAF web-based emission factor database is currently only available to financial institutions that have committed to PCAF.

Table 5.5-1. General description of the data quality score table for mortgages

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

Data Quality	Options to estimate the financed emissions		When to use each option
Score 1	**Option 1: Actual building emissions**	1a	Primary data on **actual building energy consumption** (i.e., metered data) is available. Emissions are calculated using actual building energy consumption and **supplier-specific emission factors**[138] specific to the respective energy source.
Score 2		1b	Primary data on **actual building energy consumption** (i.e., metered data) is available. Emissions are calculated using actual building energy consumption and **average emission factors** specific to the respective energy source.
Score 3	**Option 2: Estimated building emissions based on floor area**	2a	**Estimated building energy consumption per floor area based on official building energy labels**[139] **AND the floor area** are available. Emissions are calculated using estimated building energy consumption and average emission factors specific to the respective energy source.
Score 4		2b	**Estimated building energy consumption per floor area based on building type and location-specific statistical data AND the floor area** are available. Emissions are calculated using estimated building energy consumption and **average emission factors** specific to the respective energy source.
Score 5	**Option 3: Estimated building emissions based on number of buildings**	3	**Estimated building energy consumption per building based on building type and location-specific statistical data AND the number of buildings** are available. Emissions are calculated using estimated building energy consumption and **average emission factors** specific to the respective energy source

A detailed summary of the data quality score table, including data needs and equations to calculate financed emissions, is provided in Annex 10.1 (Table 10.1-5).

Financial institutions should work with actual data on the energy consumption of properties, if available. The energy consumed at the household level (e.g., gas, electricity, heating oil, wood, etc.) can be converted to CO_2e emissions using supplier-specific emission factors or average emission factors if no emissions data is provided in the chosen data sources. Some data sources report only energy use whereas others report CO_2e emissions.

[138] Supplier-specific emission factor is an emission rate provided by the energy supplier (e.g., utility) to its customers reflecting the emissions associated with the energy it provides (e.g., electricity, gas, etc.). Average emission factors represent the average emissions of the respective energy sources occurring in a defined boundary (e.g., national or subnational).

[139] In jurisdictions where official energy labels are unavailable, financial institutions may rely on alternative labels or certificates that they determine to be equivalent in specificity and quality, for the purpose of achieving a comparable data quality score.

As an intermediate step, financial institutions could start collecting building size data, in addition to geographic location and building type, and energy labels, where available, to more accurately capture the financed emissions of their mortgages.

OTHER CONSIDERATIONS

Obtaining data on energy consumption

Actual energy consumption data specific to a certain mortgage portfolio is preferred because this will be more accurate than working with average energy consumption data. In some markets with clear government partnerships on climate action, financial institutions might attempt to work at the policy level to obtain actual data directly from grid operators or government agencies.

Almost all grids are reducing their emissions over time, resulting in gradually reduced emissions for mortgage portfolios. Where possible, the most common regional electricity grid mix data for the building's location should be used; if unavailable, country-level electricity grid mix emissions data should be used. If actual consumption data is unavailable, financial institutions should start collecting building size, geographic location, and building type data to more accurately capture the associated emissions of their mortgages.

If actual energy consumption data is used, it may be unclear if all energy consumption is applicable solely for the house or, for instance, also for an electric vehicle (EV). If possible, the actual energy consumption data can be further disaggregated to differentiate the electricity used in the home from the electricity used for charging the vehicle.

Off-balance mortgages

The scope of this methodology is on-balance sheet mortgages. Off-balance sheet mortgages are not included. If relevant and substantial, off-balance sheet mortgages can be reported separately.

Distinguishing between private and corporate mortgages

No distinction is made between private or corporate mortgages.

Improving a home's energy performance

The attribution approach assumes the residential property owner also takes ownership of the building's emissions. During the mortgage period, financial institutions may have the opportunity to work with the property owner to lower the building emissions by offering additional financial services that are used to improve the energy performance of the building. Green mortgages, low carbon mortgages, or energy efficient mortgages are some of the existing products in various markets around the globe.

LIMITATIONS

Results depend on data quality

Many assumptions must be made to calculate the emissions of mortgages as data is often difficult to retrieve for privacy reasons. Even though the calculation method does not differ greatly, the data sources

used can yield different results—for instance, when average consumption data is replaced by actual consumption data from grid operators.

Country-specific assumptions

Some country-specific adjustments will need to be made to make the calculation applicable depending on the data availability and standards in each country. The variations across countries in their systems of categorizing the energy efficiency of houses require a tailored approach for optimal accuracy in calculations.

Motor vehicle loans

PCAF®
Partnership for Carbon Accounting Financials

5.6 Motor vehicle loans

ASSET CLASS DEFINITION

This asset class refers to on-balance sheet loans and lines of credit to businesses and consumers for specific (corporate or consumer) purposes - namely the finance of one or several[140] motor vehicles.

Financial institutions will finance different vehicle types and will also use different internal definitions and categories for the motor vehicle types being financed. For example, one financial institution may have a portfolio mainly of passenger cars and motorcycles, while another financial institution may have a strong share of buses and heavy-duty trucks.

This methodology does not prescribe a specific list of vehicle types falling within this asset class. Instead, it leaves it open for financial institutions to decide and define what vehicle types to include in their inventory of financed emissions. It is the responsibility of each financial institution to define the vehicle types included in their respective inventories of financed emissions and, in the case of leaving a specific vehicle type out of the GHG accounting exercise, to provide a transparent explanation of why a vehicle type is excluded.

The following non-exhaustive list provides examples of the vehicle types that may fall under the asset class of motor vehicle loans:

- Passenger car
- Motorcycle
- Light commercial truck (e.g., vans)
- Medium/heavy commercial truck
- Recreational vehicles
- Bus
- Snowmobiles/all-terrain vehicles
- Boats, including outboard motors[141]
- Yellow equipment (i.e., earth-moving vehicles for mining and construction)

Financial institutions typically finance motor vehicle loans through consumer lending or business lending. Consumer lending for motor vehicles includes financing the purchase of a motor vehicle for a private person, whereas business loans for motor vehicles typically includes financing a fleet of motor vehicles for a business.[142]

[140] A single loan might cover the purchase of several vehicles or fleets. In any case, the methodology presented in this chapter should be used.
[141] Depending on the portfolio of some financial institutions, it may be appropriate to differentiate between the vehicle and the propulsion system of that vehicle. In this case, it is possible to apply the methodology for the vehicle as a whole but also to the propulsion system on its own. An example of this are financial institutions that have boats on their portfolio. In this case, it is common to have loans for boats and also loans for outboard motors alone.
[142] Note that the term "fleet" does not necessarily refer to multiple vehicles only. It can also refer to a single business vehicle.

EMISSION SCOPES COVERED

Financial institutions shall calculate and report the annual scope 1 and scope 2 emissions of the vehicles being financed:

- Scope 1: Direct emissions from fuel combustion in vehicles
- Scope 2: Indirect emissions from electricity generation consumed in EVs (hybrid and fully EVs)

Scope 3 emissions related to the production of vehicles, delivery of vehicles to buyers, or decommissioning of vehicles after use do not need to be covered because these emissions are difficult to obtain and can be considered rather marginal. However, if a financial institution seeks to account for the production emissions of new vehicles (i.e., embodied emissions), they should report the emissions as follows:

- In the initial financing year, the financial institution shall report the production emissions of the respective vehicle as a lump sum under scope 3 emissions, while the operational emissions in the respective year shall be reported under scope 1 or 2 emissions.
- In the following financing years, the financial institution shall not report any production emissions of the respective vehicle; they shall only report the operational emissions under scope 1 or 2 emissions.

This approach on scope 3 emissions only holds for new vehicles, not used vehicles.

ATTRIBUTION OF EMISSIONS

As a basic attribution principle, the financial institution accounts for a portion of the borrower's annual motor vehicle emissions as determined by the ratio between the outstanding amount (numerator) and the value of the motor vehicle at loan origination (denominator). This ratio is called the attribution factor:

1. **Outstanding amount (numerator):** This is the actual outstanding motor vehicle loan amount, defined as the value of the debt that the debtor owes to the creditor. It will be adjusted annually to reflect the correct exposure, resulting in the attribution to decline to 0 at the end of the lifetime of the loan (i.e., when it is fully repaid). Financial institutions should either use the calendar or financial year-end outstanding loan, provided the approach is communicated and used consistently.
2. **Total value at origination (denominator):** This is the total value of the motor vehicle at loan origination, which corresponds to the price of the vehicle at the time of the transaction, i.e., equity plus debt at origination.

$$Attribution\ factor_v = \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}$$

(with v = vehicle or vehicle fleet)

If the total value of the motor vehicle at origination (i.e., the denominator) is unknown, financial institutions should take a conservative approach and assume 100% attribution. As soon as the motor vehicle loan is repaid, the financed emissions associated with that loan are equal to 0.

EQUATIONS TO CALCULATE FINANCED EMISSIONS

The financed emissions from a motor vehicle loan are calculated by multiplying the attribution factor by the emissions of the motor vehicle. The total financed emissions from multiple motor vehicle loans are calculated as follows:

$$Financed\ emissions = \sum_{v} Attribution\ factor_v\ x\ Vehicle\ emissions_v$$

(with v = vehicle or vehicle fleet)

The emissions can, in principle, be calculated by multiplying the distance traveled by the vehicle (e.g., km) by the fuel efficiency of the vehicle (e.g., l diesel/km, kWh electricity/km) and an emission factor specific to the fuel type of the vehicle (e.g., kg CO_2e/l diesel, kg CO_2e/kWh electricity). The total financed emissions from multiple motor vehicle loans are calculated as follows:

$$Financed\ emissions = \sum_{v} \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}\ x\ Vehicle\ emissions_v$$

$$Financed\ emissions = \sum_{v,f} \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}\ x\ Distanced\ traveled_v\ x\ Efficiency_{v,f}\ x\ Emission\ factor_f$$

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

The financed emissions from motor vehicle loans can be calculated in several ways depending on the availability of data to derive the emissions of the financed vehicle. Overall, PCAF distinguishes three options to calculate the financed emissions from motor vehicle loans depending on the data used:[143]

- **Option 1: actual vehicle-specific emissions**,[144] where emissions are calculated based on actual vehicle fuel consumption or actual vehicle distance traveled for a known vehicle make and model with data directly collected from the borrower.
  - **Option 1a:** Vehicle emissions are calculated based on primary data on **actual vehicle fuel consumption.**
  - **Option 1b:** Vehicle emissions are calculated based on vehicle efficiency and fuel type (fossil or electricity) from **known vehicle make and model**[145] and primary data for **actual vehicle distance traveled**.
- **Option 2: estimated vehicle-specific emissions**, where emissions are calculated based on estimated vehicle distance traveled for a known vehicle make and model with data collected from official statistics.

[143] For all options the attribution factor is calculated in the same way; the only thing changing is the way vehicle emissions are calculated
[144] For motor vehicle loans to consumers, this approach seems rather unrealistic as consumers are unlikely to report their actual fuel consumption or distance traveled to a financial institution. However, for motor vehicle loans to businesses (in particular for financing of company-owned staff cars), companies often collect information on actual fuel consumption or distance traveled and could share such information with financial institutions.
[145] Vehicle make and model refers to the name of the company that manufactures the vehicle and the product name of the vehicle. For example, Toyota Prius.

  - **Option 2a:** Vehicle emissions are calculated based on vehicle efficiency and fuel type (fossil or electricity) **from known vehicle make and model and estimated vehicle distance traveled** derived from local statistical data.[146]
  - **Option 2b:** Vehicle emissions are calculated based on vehicle efficiency and fuel type (fossil or electricity) from **known vehicle make and model and estimated vehicle distance traveled** derived from **regional statistical data.**[147]
- **Option 3: estimated vehicle-unspecific emissions**, where emissions are calculated based on estimated vehicle distance traveled for an unspecified vehicle with data collected from official statistics.
  - **Option 3a:** Vehicle emissions are calculated based on vehicle efficiency and fuel type (fossil or electricity) from **known vehicle type**[148] (vehicle make and model are unknown) and **estimated vehicle distance traveled** derived from **local or regional statistical data**.
  - **Option 3b:** Vehicle emissions are calculated based on vehicle efficiency and fuel type (fossil or electricity) from an **average vehicle** (vehicle make and model and vehicle type are unknown)[149] and **estimated vehicle distance traveled** derived from **local or regional statistical data**.

DATA REQUIRED

PCAF distinguishes three options with six sub-options to calculate the financed emissions from motor vehicle loans depending on the data used. Although Option 1b, Option 2a, and Option 2b are all based on known vehicle characteristics of vehicle efficiency and fuel type, the data used for vehicle distance traveled is of higher quality for Option 1b than it is for Option 2a, and it is of higher quality for Option 2a than it is for Option 2b. In this sense, while there are several options to calculate financed emissions, the quality of the results is not the same for all these options. For this reason, PCAF gives a higher score to results obtained with higher data quality and a lower score to results obtained with lower data quality (score 1 = highest data quality; score 5 = lowest data quality). If a financial institution uses a mix of options to calculate the emissions of a borrower, the data score for the lower-rated option should be assumed for this borrower (i.e., score 4 from Option 3a). Take for instance a line item for which actual distance traveled and vehicle type are known, while vehicle make and model are unknown. This means that Option 1b and Option 3a are mixed, and therefore, the highest possible data quality score this line item could receive is score 4. This is because that is the score of the lowest-rated option in the mix, Option 3a.

Table 5.6-1 provides data quality scores for each of the described options that can be used to calculate the financed emissions for motor vehicle loans.

[146] Local statistical data refers to statistical data at the province/state or small country level.
[147] Regional statistical data refers to statistical data at the large country or a subcontinental level.
[148] Vehicle type refers to an overall vehicle class such as passenger car, bus, or light commercial truck.
[149] If it is not possible to know the vehicle type, then an average vehicle can be assumed.

Table 5.6-1. General description of the data quality score table for motor vehicle loans

(score 1 = highest data quality; score 5 = lowest data quality)[150,151]

Data Quality	Options to estimate the financed emissions		When to use each option
Score 1	**Option 1: Actual vehicle-specific emissions**	1a	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Primary data on **actual vehicle fuel consumption** is available. Emissions are calculated using actual fuel consumption and fuel type-specific emission factors.
		1b	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are available from **known vehicle make and model.**[152] Primary data on **actual vehicle distance** traveled is available. Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.
Score 2	**Option 2: Estimated vehicle-specific emissions**	2a	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are available from **known vehicle make and model. Distance traveled is estimated based on local statistical data.**[153] Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.
Score 3		2b	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are available from **known vehicle make and model. Distance traveled is estimated based on regional statistical data.**[154] Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.
Score 4	**Option 3: Estimated vehicle-unspecific emissions**	3a	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are estimated from **known vehicle type** (vehicle make and model are unknown).[155] **Distance traveled is estimated based on local or regional statistical data.** Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.
Score 5		3b	Outstanding amount and total value at origination of vehicle or vehicle fleet are known. Vehicle efficiency and fuel type (fossil and/or electricity) are estimated for an **average vehicle** (vehicle make and model and vehicle type are unknown).[156] **Distance traveled is estimated based on local or regional statistical data.** Emissions are calculated using estimated fuel consumption and fuel type-specific emission factors.

A detailed summary of the data quality score table, including data needs and equations to calculate financed emissions, is provided in Annex 10.1 (Table 10.1-6).

Data for all three options can be derived from different data sources. Data on vehicle efficiency and fuel type per vehicle make and model can be derived from official statistical data sources such as the US EPA's

[150] Fuel type in the case of electric or hybrid vehicles can also refer to electricity.
[151] For all options shown in the table, supplier-specific emission factors (e.g., from electricity provider) for the respective primary activity data are always preferred over non-supplier-specific emission factors (i.e., also sometimes referred to as average emission factors).
152 Vehicle make and model refers to the name of the company that manufactures the vehicle and the product name of the vehicle. For example, Toyota Prius.
[153] Local statistical data refers to data at the province/state or small country level.
[154] Regional statistical data refers to data at the large country or a subcontinental level.
[155] Vehicle type refers to a passenger car, bus, or light commercial truck.
[156] If it is not possible to know the vehicle type, an average vehicle can be assumed.

Federal Test Procedure[157] and the EEA's Worldwide Harmonized Light Vehicles Test Procedure (WLTP).[158] Both data sources provide detailed vehicle efficiency and fuel type information by make and model. Option 1b, Option 2a, and Option 2b require such information. If make and model are unknown to the reporting financial institution (Option 3), vehicle efficiency and fuel type can be estimated on the vehicle type level (e.g., passenger car) using the International Council on Clean Transportation's (ICCT's) Transportation Roadmap[159] or the International Transport Forum at the Organisation for Economic Co-operation and Development (ITF OECD).[160]

If no actual distance traveled is known to the reporting financial institution, data on vehicle distance traveled can be estimated based on data sources such as the ICCT Transportation Roadmap or the ITF OECD. Several local statistical data sources provide geography-specific vehicle distances traveled. For the US and Canada, state- or province-level distance per year can be retrieved from carinsurance.com[161] and the Canadian Office of Energy Efficiency.[162]

PCAF's web-based emission factor database, which is currently available only to financial institutions that have committed to PCAF, provides emission factors per vehicle type (e.g., passenger car) and per vehicle make and model (e.g., VW Polo) for a large set of geographies. These motor vehicle emission factors are widely based on the sources mentioned above.

PCAF expects that the financed emissions for motor vehicle loans can be derived through either actual vehicle-specific emissions (Option 1), estimated vehicle-specific emissions (Option 2), or estimated vehicle-unspecific emissions (Option 3). However, PCAF allows the use of alternative approaches to calculate emissions if none of the specified options can be used or in the case that new approaches are developed. The reporting financial institution shall always explain the reasons for using an alternative approach if it deviates from the options defined above.

LIMITATIONS

Data availability

Information regarding actual vehicle distance traveled may not be easily available. If actual data is unavailable, PCAF proposes using local or regional averages on vehicle distance traveled by state,

[157] The US EPA's Federal Test Procedure is a series of drive cycle tests to measure the tailpipe emissions and fuel efficiency of passenger cars. Because these tests are used to verify that cars sold in the US meet EPA regulatory standards, their results reflect the road performance of passenger cars in the US. The results for more than 4,000 makes and models are publicly available on fueleconomy.gov, downloadable in .csv format.

[158] The WLTP is a global, harmonized standard of drive cycle tests to determine the tailpipe emissions and fuel efficiency of passenger cars. It was developed by the United Nations Economic Commission for Europe to replace the old New European Driving Cycle (NEDC) as the European vehicle homologation procedure. The NEDC was shown to be flawed, enabling manufacturers to meet EU environmental standards during lab tests but not on the road (Dieselgate). The WLTP was conceived to rectify this. The WLTP final version was published in 2015. Hence, even though it will become a truly international standard in time, it is only used in the EU for now, and its results only reflect the performance of cars sold within the EU. These results are published by the EEA in .csv format and can be downloaded at https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-16

[159] The ICCT's Transportation Roadmap has been a global reference for environmental performance data on all major transportation modes, fuel types, and vehicle technologies since 2012. Over the past decade, the ICCT has extended its roadmap model to cover 11 of the largest vehicle markets (Australia, EU, Brazil, Canada, China, India, Japan, Mexico, South Korea, Russia and the US) and five aggregate regions (Africa, Other Asia-Pacific, Other Europe, Other Latin America, and the Middle East). The most recent results of the model (2017) are downloadable in .xlsx format on the ICCT website: https://theicct.org/transportation-roadmap#about.

[160] The OECD iLibrary maintains a database of transport statistics collected by the ITF on the transport of freight (maritime, air, and surface) and passengers (car, rail, and air) in its member states

[161] More information can be found at: https://www.carinsurance.com/Articles/average-miles-driven-per-year-by-state.aspx

[162] More information can be found at: http://oee.nrcan.gc.ca/publications/statistics/cvs08/appendix-1.cfm?graph=6&attr=0

province, country, or region. PCAF proposes that financial institutions collect the actual vehicle make and model to determine the exact vehicle efficiency and fuel type. If the financial institution does not track the vehicle make and model, PCAF proposes that the financial institution fall back to a generic vehicle type (e.g., passenger car, motorcycle, light commercial truck, medium/heavy commercial truck, bus) or to an average vehicle as a last resort. For average vehicles, the vehicle efficiency is determined by the weighted average vehicle efficiency in the respective geography.

Dual fuel vehicles

For dual fuel vehicles, the percentage of usage per fuel (e.g., gasoline vs. electricity) may be unknown. If the vehicle make and model is known, PCAF recommends assuming an average usage split for the respective hybrid vehicle based on information from national agencies or the vehicle manufacturer. If such information is not available, PCAF proposes either applying an average geography-specific usage split, or, if that is also not available, the conservative assumption that the combustion engine (e.g., gasoline) is used 100% of the time.

Electricity grid estimates

Exact electricity source data will not be known for each vehicle in a financial institution's portfolio (e.g., where does the borrower source electricity? Does the borrower source gray or green electricity?). Where possible, the most common local or regional electricity grid mix emission factor for the borrower's location should be used. If unavailable, the most common local or regional electricity grid mix emission factor for the financial institution's branch should be used (i.e., location of the financial institution where the loan was issued). If also unavailable, country-level electricity grid mix emissions data should be used.

Use of proceeds structures

PCAF®
Partnership for
Carbon Accounting
Financials

5.7 Use of proceeds structures

ASSET CLASS DEFINITION

This method includes all on-balance sheet debt and equity to use of proceeds structures (UoP structures). UoP structures contain a pool of one or multiple underlying assets, which may belong to any asset class. Examples of such assets include companies, projects, and buildings. In certain cases, an underlying asset may itself be a UoP structure itself, for instance when an investment fund (a UoP structure) invests into a green bond (a UoP structure).

This method distinguishes between two types of UoP structures: 'separate' UoP structures that are stand-alone entities, and 'integrated' UoP structures that are part of an issuer. Table 5.7-1 provides a non-exhaustive overview of UoP structures and whether they can be accounted for using this method. More detailed guidance can be found in the section 'GHG accounting treatment'.

Table 5.7-1. Overview of UoP structures

UoP structures	Inclusion guidance
Equity funds and debt funds	**Included** as separate UoP structure
Holding companies and other types of special purpose vehicles without control over underlying assets (e.g. debt or minority equity stakes)	**Included** as separate UoP structure
Labeled bonds/loans allocated to specific assets (e.g. most green and social bonds/loans)	**Included** as integrated UoP structure. If not feasible to account as UoP structure (e.g. due to data limitations), accounted on issuer level – accounting approach based on customer segment classification in Step 3a of Figure 5-1.
Labeled bonds/loans not allocated to specific assets (e,g most sustainability linked loans and bonds)	**Not included** as it is not a UoP structure. Accounted on issuer level – accounting approach based on customer segment classification in Step 3a of Figure 5-1.
Project finance structured via a special purpose vehicle	**Not included.** Classified as separate UoP structure but accounted in line with 'Project Finance' method
Debt-based with one fully allocated asset (e.g. single mortgage, motor vehicle loan or project)	**Not included**. Classified as integrated UoP structure but accounted in line with applicable asset class method (e.g. mortgages, commercial real estate or motor vehicle loan). For project finance, accounted in line with 'Project Finance' method using the section 'Accounting for projects without a separate balance sheet'.
Loan allocated to multiple specific assets on the issuer's balance sheet (e.g. specific projects)	**Included** as integrated UoP structure. If not feasible to account as UoP structure (e.g. due to data limitations), accounted on issuer level – accounting approach based on customer segment classification in Step 3a of Figure 5-1.
Top-level holding with control over underlying companies	**Not included.** Classified as separate UoP structure but accounted in line with 'Listed equity and corporate bonds' method or 'Business loans and unlisted equity' method.
General purpose loans, working capital loans and general corporate bonds	**Not included** as it is not a UoP structures. Accounting approach based customer segment classification in Step 3a of Figure 5-1.

Separate UoP structures **shall** be accounted for using this method. Integrated UoP structures **should** be accounted for based on this method; however, investors **may** calculate financed emissions using issuer-level data when sufficient information on fund allocation is unavailable. More detailed guidance can be found in the 'Equations to calculate financed emissions' section.

This method defines two roles for UoP structures (Figure 5.7-1):

- Investors: this method uses the general term 'investors' to cover any debt or equity provider to a UoP structure. These parties could be banks and asset owners. The investor is usually called 'lender' for labeled loans.
- Issuers: this method uses the general term 'issuer' to cover any party that creates, issues, or manages a UoP structure. These parties could be financial institutions, corporates, sovereigns, or consumers. The issuer is usually called 'fund manager' for equity/debt funds, or 'customer', 'investee' or 'borrower' for labeled loans.

Investors use this method to calculate the financed emissions related to their debt or equity provision to a UoP structure. Issuers use this method to calculate the financed emissions of the UoP structure itself. In addition, facilitators may facilitate the issuance of certain UoP structures (see Figure 5.7-1). The associated calculation of facilitated emissions may be covered by future additions to Part B.

Figure 5.7-1. Overview of the different roles surrounding UoP structures

Key questions for accounting treatment are indicated in blue

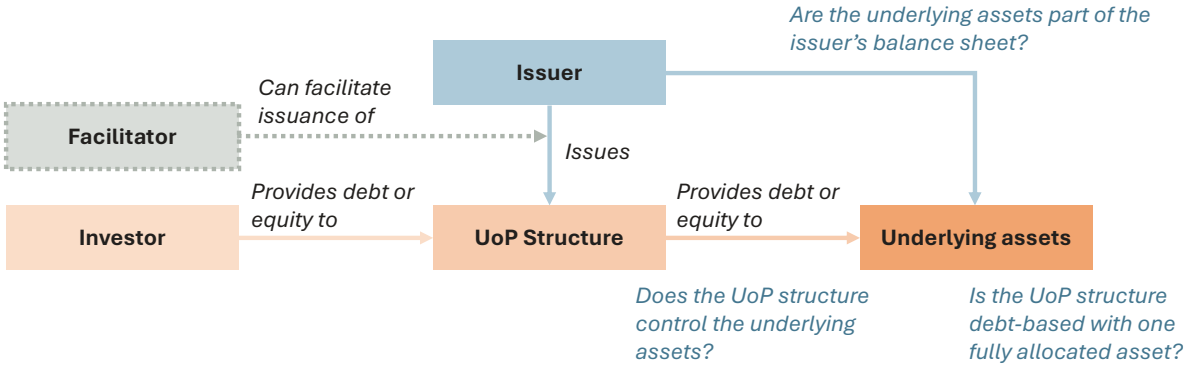


Figure 5.7-1 indicates key questions for the GHG accounting treatment of UoP structures in blue. More detailed guidance on these questions can be found in the section on 'GHG accounting treatment'.

EMISSION SCOPES COVERED

In general, the GHG accounting approach for each underlying asset is selected based on Figure 5-1. For example, a general-purpose loan provided by a UoP structure to an unlisted company will be accounted for in line with the Business Loans and Unlisted Equity asset class.

Consequently, the emissions scopes covered for each underlying asset **shall** follow the requirements in the section 'Emission scopes covered' of the applicable asset class methodology.

ATTRIBUTION OF EMISSIONS

Annual emissions of UoP structures are calculated via a double attribution consisting of:

1. Attribution of the investor in the UoP structure
2. Attribution factors of the UoP structure in the underlying assets

$$Attribution\ factor\ = (1)\frac{Outstanding\ amount\ investor}{Total\ equity + debt\ in\ UoP\ structure} * (2)\sum_{asset} Attribution\ UoP\ structure_{asset}$$

Outstanding amount investor: This is the actual outstanding amount of the investor in the UoP structure, which should be defined in line with the denominator. Financial institutions should either use the calendar or financial year-end outstanding amount, provided the approach is communicated clearly and used consistently.

a. For debt, this is defined as the book value of the debt that the borrower owes to the lender (i.e., disbursed debt minus any repayments).
b. For equity, this is the outstanding value of equity that the financial institution holds in the UoP structure. It is calculated by multiplying the relative share of the financial institution in the UoP structure[163] by the total equity of the UoP structure.

Total equity + debt in UoP structure (denominator): this is the sum of total equity[164] and debt[165] in the UoP structure. For separate UoP structures that are separate legal entities, total equity and debt can be found on the balance sheet.[166] For other UoP structures, total debt and equity **should** be reported by the issuer. For example, fund managers report the total amount of debt and equity in an investment fund and bond issuers report the total amount of debt in a particular bond.

Attribution factors underlying assets: the attribution factor for each underlying asset is calculated in line with the applicable asset class methodology. For example, if the underlying asset is a project, the attribution factor would be 'Outstanding amount / Total equity + debt' in line with the attribution factor defined in the Project Finance asset class.

[163] The relative share of the financial institution in the respective investee is calculated by dividing the number of shares that the financial institution holds in the respective investee by the total number of shares of the investee.
[164] In cases where the total equity value according to the client's balance sheet is negative, the FI shall set total equity to 0; this means that all emissions are attributed to debt only, while no emissions are attributed to equity investments. Such cases can happen when the retained earnings are negative while at the same time being higher than the other equity components on the balance sheet of the client.
[165] Total debt includes both current and long-term debt.
[166] If total debt or total equity cannot be obtained from a client's balance sheet for whatever reason (e.g., for some it might be difficult to obtain these values), FIs may fall back to the total balance sheet value (i.e., the sum of total equity and liabilities, which is equal to the client's total assets) with the intention of improving this data quality in the future.

EQUATIONS TO CALCULATE FINANCED EMISSIONS

Separate UoP structures

For separate UoP structures, financed emissions are calculated by multiplying the investor's attribution factor of the UoP structure, defined as the outstanding amount divided by the total equity and debt in the UoP structure, by the sum of each asset-specific attribution factor and the asset's annual emissions. The emissions of each underlying asset are calculated in line with the applicable asset class methodology.

$$Financed\ emissions\ separate\ UoP\ structure\ = \frac{Outstanding\ amount\ investor}{Total\ equity + debt\ in\ UoP\ structure} * \sum_{asset} Attribution\ factor_{asset} * Emissions_{asset}$$

For separate UoP structures, financed emissions are only calculated once funds have been allocated under the UoP structure; it is assumed that the sole provision of cash through unallocated amounts does not generate emissions.[167] Therefore, financed emissions will be zero at issuance, unless assets were immediately allocated under the UoP structure at issuance.

Integrated UoP structures

For integrated UoP structures, emissions are calculated for both allocated and unallocated amounts; it is assumed that the sole provision of cash through unallocated amounts supports the economic activity of the issuer and therefore generates financed emissions.

$$Financed\ emissions\ integrated\ UoP\ structure = Financed\ emissions\ allocated\ amounts + Financed\ emissions\ unallocated\ amounts$$

The financed emissions for allocated amounts **should** be calculated similarly to separate UoP structures:

$$Financed\ emissions\ allocated\ amounts\ integrated\ UoP\ structure\ = \frac{Outstanding\ amount\ investor}{Total\ equity + debt\ in\ UoP\ structure} * \sum_{asset} Attribution\ factor_{asset} * Emissions_{asset}$$

For integrated UoP structures, investors **may** calculate financed emissions for allocated amounts based on issuer-level data.[168] The accounting approach depends on the nature of the issuer and is based on customer segment classification in Step 3a of Figure 5-1. Investors **may** choose to take an issuer-level approach due to the following reasons:

- **Theoretically impossible**: The emissions of the underlying assets cannot be defined independently. For more information see subsection 'Accounting for projects without a separate balance sheet' in the Project Finance asset class.

[167] For separate UoP structures the underlying assets are not part of the issuer's balance sheet, so estimating financed emissions based on issuer-level data would be incorrect.

[168] If an investor opts to use issuer-level data for both allocated and unallocated amounts, the financed emissions formula simplifies as the same issuer-level calculation approach is used for the combined allocated and unallocated amounts.

- **Practically not feasible**: There is no sufficient data available on how the funds are allocated.
- **Not material:** The calculated emissions are not expected to materially differ from issuer-level estimates. This happens when the emissions intensity of the assets in the UoP structure and the emissions intensity of the issuer are similar.

For unallocated amounts, financed emissions are calculated based on issuer-level data. The accounting approach depends on the nature of the issuer and is based on customer classification in Step 3a of Figure 5-1. Investors **may** estimate emissions for unallocated amounts using asset-level data if there is sufficient evidence on the expected allocation of the unallocated amounts. For example, if the integrated UoP structure is expected to only invest in a single sector (e.g. renewable energy projects), emissions for unallocated amounts can be estimated based on sectoral emission factors (see the estimation approach based on data quality score 5 in the 'Data required' section). Another example is integrated UoP structures used to refinance existing assets – the emissions of these existing assets and the expected investment size can then be used to estimate emissions.

Reported emissions by issuer

Ideally, financed emissions of the UoP structure are calculated and reported directly by the issuer in line with this method in an annual allocation and impact report. When a financial institution issues a UoP structure, the institution **shall** report the financed emissions of the UoP structure separately.[169] In addition, when financial institutions invest in UoP structures, they **should** encourage issuers to implement separate reporting in a similar fashion. If the issuer reported the financed emissions of the UoP structure, the investor can calculate financed emissions as follows:

$$Financed\ emissions\ = \frac{Outstanding\ amount\ investor}{Total\ equity + debt\ in\ UoP\ structure} * Reported\ financed\ emissions\ UoP\ structure$$

Outstanding amount

The outstanding amount to be reported for UoP structures is calculated as follows:

$$Outstanding\ amount = Outstanding\ amount\ investor * \ Allocation\ percentage\ UoP\ structure$$

This outstanding amount is used to calculate portfolio numbers for the economic emissions intensity and the data quality score.

For integrated UoP structures, the allocation percentage in the above formula **shall** be assumed as 100% since emissions are calculated both for the allocated and unallocated amounts. For separate UoP structures, the allocation percentage is calculated as follows:

[169] If an FI is both an investor and an issuer, and the FI is already reporting financed emissions for its lending book in line with Part A, this data can be directly used for the financed emissions of integrated UoP structures issued by the FI.

$$Allocation\ percentage\ separate\ UoP\ structure^{170} = \frac{\sum_{asset} Outstanding\ amount\ UoP\ structure_{asset}}{Total\ equity + debt\ in\ UoP\ structure}$$

For example, if an investor has put 50 MEUR in a debt fund with a total size of 100 MEUR and the debt fund has invested 10 MEUR in underlying assets, the allocation percentage will be 10/100 = 10%. This means that 10% * 50 MEUR = 5 MEUR is used as the outstanding amount for the calculations.

If the outstanding amounts in the underlying assets are not available, the investor **may** use the asset values listed on the balance sheet of the UoP structure to estimate the outstanding amounts.

For separate UoP structures, the allocation percentage is 0% at issuance, unless assets are immediately allocated at issuance. When the UoP structure is fully allocated, this is 100%. If the allocation percentage for a separate UoP structure is unknown, the assumption **may** be made that the allocation percentage is 100%. However, if this assumption is made, financed emissions **shall** be calculated for the unallocated amounts of the separate UoP structure – this ensures consistency between the calculations of financed emissions and outstanding amount. Financed emissions can be estimated for unallocated amounts by, for example, using the estimation approach based on data quality score 5 below.

DATA REQUIRED

If reported emissions of the UoP structure are not available, emissions of underlying assets can be estimated in line with the applicable asset class methodologies. For example, the Project Finance chapter allows emissions to be estimated using default emissions factors based on physical activity (e.g., tCO_2e/MWh) or economic activity (e.g., tCO_2e/€ of revenue or tCO_2e/€ of asset).

The data quality score for the UoP structure **shall** be calculated based on a weighted average by outstanding amount of the underlying assets. If there are no assets allocated under the UoP structure, the data quality score cannot be defined.

Emissions estimations based on data quality score 5 for corporates and projects

It is recognized that data availability will remain a challenge until issuers report emissions.[171] Nonetheless, investors (and/or their data providers) can estimate emissions of UoP structures comprising of corporate and project-based assets based on the data quality score 5 used in the asset classes for Listed Equity and Corporate Bonds, Business Loans and Unlisted Equity, and Project Finance. The equation to calculate financed emissions becomes:

[170] For equity funds, it is technically possible for the allocation percentage to be above 100% since the outstanding amount for unlisted equity is calculated by multiplying the relative equity share with the total equity for the underlying assets. This value might be larger than the asset value listed on the balance sheet of the UoP structure.

[171] For example, the Handbook for a Harmonized Framework for Impact Reporting from the International Capital Market Association (ICMA) mentions absolute emissions under 'Other indicators' for certain sectors, but not as 'Core indicators', https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Handbook-Harmonized-Framework-for-Impact-Reporting-December-2020-151220.pdf.

$$Financed\ emissions\ = Outstanding\ amount\ * \sum_{sector} Emission\ factor\left(\frac{tCO2_2e}{Euro\ or\ dollar\ invested}\right)_{sector} * Allocation\ percentage_{sector}$$

Outstanding amount: The outstanding amount used depends on whether emissions are intended to be estimated for the allocated amounts, unallocated amounts or for both. For example, if emissions data is available for allocated assets under an integrated UoP structure, the data quality 5 estimation can be used only for the unallocated assets. If no emissions data is available at all for an integrated UoP structure at issuance, the data quality 5 estimation can be used to estimate emissions for the allocated and unallocated amounts combined.

Emission factors: The asset classes Listed Equity and Corporate Bonds, Business Loans and Unlisted Equity, and Project Finance provide further guidance on where to find suitable emission factors, such as EEIO databases. For example, if certain underlying assets are solar projects, this can be captured by a specific emission factor for the solar sector. For green bonds, emission factors could be mapped to categories defined by the ICMA Green Bonds Principles.[172]

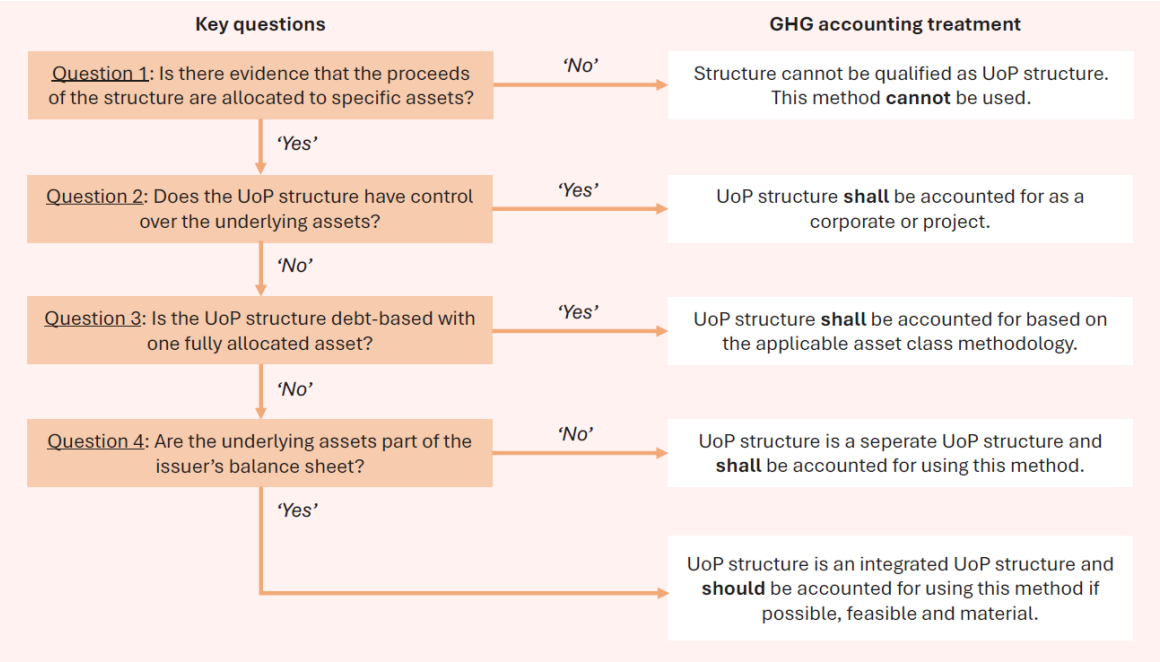
Allocation percentage sectors: The percentage of funds that has been allocated to different sectors. If direct allocation data is not available, these percentages **may** be estimated based on supporting documentation. For example, a prospectus or bond framework might indicate what sectors the money is earmarked for.

[172] https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks/green-bond-principles-gbp/

GHG ACCOUNTING TREATMENT

The GHG accounting treatment for different UoP structures is summarized in Figure 5.7-2. The questions in the figure are further elaborated below.

Figure 5.7-2. Decision tree for GHG accounting treatment for UoP structures



Question 1: Is there evidence that the proceeds of the structure are allocated to specific assets?

To answer Question 1 as Yes: financial institutions **shall** be transparent as to why an investment qualifies as a UoP structure. For this, it shall be evidenced that proceeds are only allocated to specific assets, for example through legal documentation at contracting or allocation reports by the issuer.

For the calculation of financed emissions, it is not relevant whether a UoP structure can be labeled specifically as, for example, green', transition finance', or 'sustainable' since estimations **shall** reflect actual emissions of underlying assets. Therefore, such labeling methodologies are outside the scope of this method. Nevertheless, this method is particularly useful for UoP structures with low-carbon assets, such as green bonds and green loans, as it allows for the accounting of emissions based on these underlying assets. This will generally lead to reduced financed emissions compared to issuer-level estimates.

When answer to Question 1 is No: If there is no sufficient evidence that proceeds are allocated to specific assets, the structure cannot be qualified as a UoP structure, and this method cannot be used. The asset class is selected based on customer segment classification in Step 3a of Figure 5-1 of Part A. Examples are general purpose loans, working capital loans and general corporate bonds.

Question 2: Does the UoP structure have control over the underlying assets?

To answer Question 2 as Yes: Only UoP structures that provide equity can have control over the underlying assets.[173] The main example of this is a top-level holding company in a corporate structure. In this case, the financials of the underlying assets are generally consolidated on the balance sheet of the holding company. The holding company uses the GHG Protocol Corporate Accounting and Reporting Standard to define its organizational boundaries. If a control approach is used, the scope 1 emissions of the underlying assets are consolidated as the scope 1 emissions of the holding, and similarly for scope 2 and 3. If an equity share approach is used, the emissions of the underlying assets are proportionally consolidated based on the equity share.

In essence, a UoP structure with control over the underlying assets is equivalent to a corporate. Depending on whether the UoP structure is listed or not, it **shall** be accounted in line with the Listed Equity and Corporate Bonds method or the Business Loans and Unlisted Equity method. There is one exception to this rule – the UoP structure **shall** be accounted in line with the Project Finance method if (1) there is one fully allocated asset under the UoP structure and (2) this asset is a project. This happens, for example, when a special purpose vehicle is set up to finance a project.

If answer to Question 2 Is No: If the UoP structure does not have control over the underlying assets, it can be conceptualized like a financial institution because the UoP structure is essentially an entity that provides debt or equity. As a result, Part A is applicable to the UoP structure, which means that financed emissions can be calculated for the UoP structure itself. One important consequence is that UoP structures shall apply the control approach to consolidate emissions, as outlined in section 4.2 of Part A.

Question 3: Is the UoP structure debt based with one fully allocated asset?

To answer Question 3 as Yes: A debt based UoP structure has only debt flowing in and out of the structure, i.e. investors provide only debt to the UoP structure and the UoP structure provides only debt to underlying assets. When there is only one underlying asset to which all debt in the debt based UoP structure is allocated, the UoP structure **shall** be accounted for based on the applicable asset class methodology. The asset class is selected based on asset type in Step 6 of Figure 5-1 of Part A. Examples are motor vehicle loans, mortgages, and commercial real estate.

If answer to Question 3 is No: The UoP structure can be accounted for using this method and the specific GHG accounting treatment is determined based on questions 4 and 5.

Question 4: Are the underlying assets part of the issuer's balance sheet?

If answer to Question 4 is Yes: If the underlying assets are part of the issuer's balance sheet, the UoP structure is called an 'integrated UoP structure'. Examples are:

[173] Control is used as a combined term here to refer to both the financial control and operational control approaches under the GHG Protocol Corporate Accounting and Reporting Standard.

- Loan contracts specifying that proceeds will be allocated to designated projects, or to the purchase and refinance of residential property.
- Labeled debt, such as labeled bonds and labeled loans. In this case, the issuer allocates assets to the UoP structure based on certain characteristics, e.g. a 'green' loan or 'social' bond.

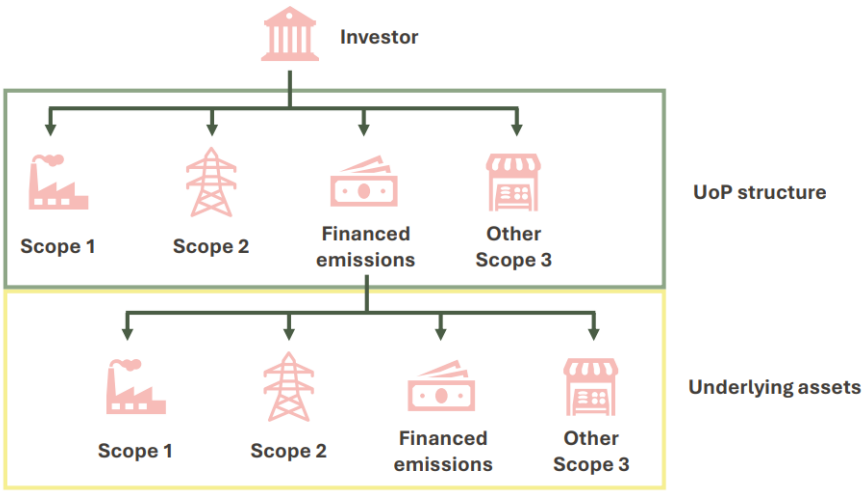
Integrated UoP structures **should** be accounted for based on this method, but investors **may** calculate financed emissions based on issuer-level data (see section 'Equations to calculate financed emissions').

To answer Question 4 as No: The underlying assets can appear on the issuer's balance sheet as physical assets (e.g. a project the issuer owns and operates) or as financial assets (e.g. a loan the issuer provides to a company). If the underlying assets are not part of the issuer's balance sheet, the UoP structure is called a 'separate UoP structure'. Examples are debt funds, private equity funds and certain special purpose vehicles. Separate UoP structures **shall** be accounted for using this method.

ASSESSMENT BOUNDARY

For UoP structures accounted using this method, investors **shall** draw the assessment boundary around the underlying assets in line with the follow-the-money principle, i.e. around the yellow box in Figure 5.7-3. This means that the scope 1 emissions of underlying assets are reported within the investor's scope 3 category 15 as the financed scope 1 emissions of the investor, and similarly for scope 2 and 3.

Figure 5.7-3. Assessment boundary



When the assessment boundary is drawn around the underlying assets, the implicit assumption is made that the UoP structure does not generate any other material emissions than those related to the underlying assets. This is generally accurate as a UoP structure itself essentially does not have any independent economic activities. However, an argument can be made that the UoP structure also has scope 3 emissions related to purchased services from the issuer. The logic followed is that the management of a UoP structure by the issuer generates emissions, for example for business travel to perform due diligence for potential investments or for office buildings that are used by the issuer. The UoP structure might pay a management fee for these services. However, this method considers that these emissions related to

purchased services from the issuer are not material compared to the emissions of the underlying assets and can therefore be neglected in the GHG accounting approach.

ADJUSTMENT FOR UNDER- AND OVERALLOCATION IN INTEGRATED UOP STRUCTURES

The methodology outlined in the above sections has implications for 'non-UoP' investors, who provide loans without known use of proceeds or equity. Under- or overallocation of emissions can occur if the emissions and total debt[174] of integrated UoP structures are not correctly considered by non-UoP investors.

To resolve this issue, non-UoP investors **should** calculate financed emissions by restricting their assessment boundary to the issuer's assets not covered by integrated UoP structures. The equation to calculate financed emissions becomes:

$$\frac{Outstanding\ amount}{(EVIC\ or\ Total\ equity) + Total\ debt - UoP\ debt}\ x\ (Company\ emissions - UoP\ emissions)$$

In practice, this is only feasible when the emissions and total debt of integrated UoP structures are separately disclosed. Therefore, when a financial institution issues an integrated UoP structure, the institution **shall** report separately the emissions (in line with applicable PCAF reporting requirements) and total debt covered by the structure to inform investors in the structure. In addition, when financial institutions invest in an integrated UoP structure, they **should** encourage issuers to implement similar separate reporting.

Nevertheless, non-UoP investors **may** calculate financed emissions based on the issuer's unadjusted total debt and emissions. Investors may choose to do this due to the following reasons:

- Theoretically impossible due to interconnected emissions: the emissions of integrated UoP structures cannot be independently defined. For more information see subsection 'Accounting for projects without a separate balance sheet' in the Project Finance asset class.
- Theoretically impossible due to interconnected debt + equity: the total debt of the integrated UoP structures cannot be separated from the issuer's total debt + equity. One example are sovereigns – since the financed emissions of sovereign debt are calculated using PPP-adjusted GDP instead of total debt + equity, it is theoretically impossible to adjust the PPP-adjusted GDP for the debt of integrated UoP structures.
- Practically not feasible: there is no sufficient data available to adjust.
- Not material: the integrated UoP structures are demonstrated to be not material within the issuer's emissions and total debt + equity, i.e. the adjusted and unadjusted figures would practically lead to the same results.

[174] Investors can only provide debt to integrated UoP structures, not equity.

When an investor has both UoP instruments (e.g. green bond) and non-UoP instruments (e.g. general corporate bond) in the same issuer, and the investor uses this method to calculate asset-specific emissions for its UoP instruments, the investor **shall** make an adjustment for its non-UoP instruments based on the data used for its UoP instruments. An exception is only allowed if it is theoretically impossible to make the adjustment, for example if issuer-level emissions cannot be calculated or there is interconnected debt + equity (e.g. for sovereign debt).

Securitization and structured products

PCAF®
Partnership for Carbon Accounting Financials

5.8 Securitization and structured products

INTRODUCTION

The purpose of this method is to provide guidance to financial institutions on how to calculate financed emissions of securitizations and structured products. The methodology leverages existing guidance on residential and commercial mortgages, business loans, and motor vehicle financing, and where relevant provides a recap of key points, but further information is available in the existing asset class guidance. Where securitizations and structured products are labeled as 'Secured green standard bonds' or similar (e.g. green RMBS), the subchapter on Use of Proceeds Structures and the supplemental guidance on Financed Avoided Emissions may be relevant.

Similar to other bonds, the issuance of structured products involves capital market functions. Part B may be updated in due course to provide a specific methodology for calculating facilitated emissions for securitizations and structured products based on this methodology for financed emissions.

The 'Structural considerations in securitizations and structured products' section later in this chapter forms part of the method and is referenced where appropriate. All relevant terms and definitions can be found in the glossary.

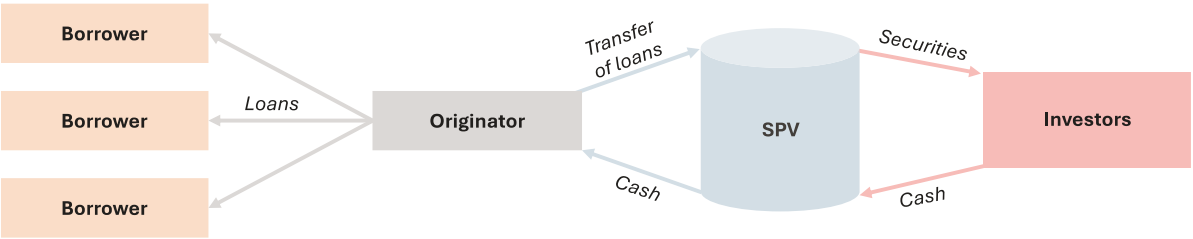
ASSET CLASS DEFINITION

Securitization is the process by which income-producing assets are typically sold by loan/lease originator(s) into a bankruptcy-remote entity, ringfencing them from the corporate risk of the originator. The entity can be a trust, special purpose vehicle (SPV), special purpose entity (SPE), or similar. This entity acts as the issuer of the securities issued to investors, off the back of the asset collateral, which forms the collateral pool for the deal. For some types of structures, such as covered bonds or synthetic securitizations (which are also covered by this methodology), the collateral pool (also known as reference pool) may remain on the originator's balance sheet rather than being sold to a trust or SPV, with ringfencing achieved through alternative legal provisions and contractual structures. For simplicity, this guidance refers to the issuing entity, which holds the collateral pool, as "SPV".

Assets in the collateral pool are held solely for the benefit of the investors. The assets could include a single loan/lease or a pool of loans/leases. For the sake of consistency, we will use the term "loan(s)" throughout this methodology to represent both loans and leases.

In securitization, investment banks create bond tranches by structuring the repayment of the debt (from the underlying assets) into different priorities to meet varying investor demands for risk, yield, maturity, etc. These tranches create the capital structure or capital stack. Bonds are typically issued by the SPV for each tranche and sold to investors.

Figure 5.8-1. Typical securitization process



For the sake of consistency, the term "structured products" will be used throughout this methodology to mean any whole loans (untranched), private asset-backed finance, and public securitizations where assets are legally ringfenced to achieve bankruptcy remoteness.

This asset class includes securitizations and structured products with various types of underlying collateral. An evaluation of the underlying collateral must be performed to determine the applicable methodology. Table 5.8-1 provides a summary of common collateral types that underpin structured products backed by different assets.

Table 5.8-1. General description of structured products in scope

Collateral type	Structured product type/acronym	Structured product investment	Inclusion guidance and PCAF reference
Residential and commercial real estate	RMBS	Agency and Non-Agency Residential Mortgage-Backed Securities (RMBS)	**Included** Built upon PCAF guidance in Part A (Mortgages subchapter 5.5)
	CMBS & CMO	Agency and Non-Agency Commercial Mortgage-Backed Securities (CMBS) Commercial Mortgage Obligations (CMO)	**Included** Built upon PCAF guidance in Part A (Commercial Real Estate subchapter 5.4 , and Mortgages subchapter 5.5 as appropriate)
	Mortgage Covered Bonds	Residential Mortgage Covered Bonds Commercial Real Estate Mortgage Covered Bonds	**Included** Built upon PCAF guidance in Part A (Mortgages subchapter 5.5, Commercial Real Estate subchapter 5.4)
	ABS/MBS	Other Property Backed Asset Backed Securities (such as, Triple Net Lease, Manufactured Housing, Data Center, Single Family Rental, Timeshare)	**Included** Built upon PCAF guidance in Part A (Commercial Real Estate subchapter 5.4)
Business loans & Corporate bonds	CLO & CDO	Collateralized Loan Obligations (CLOs) Collateralized Debt Obligations (CDOs)	**Included** Built upon PCAF guidance in Part A (Business Loans and Unlisted Equity subchapter 5.2 and Listed equity and corporate bonds subchapter 5.1) for CLOs, and as appropriate for CDOs

Auto loans & leases	ABS	Automotive Asset Backed Securities (Auto ABS)	**Included** Built upon PCAF guidance in Part A (Motor Vehicle Loans subchapter 5.6)

Structured products out of scope			
Other hard assets	ABS	Other Hard Asset Backed ABS (e.g. Aircraft, Solar, Railcar, Equipment)	**Not included**, unless FI has access to asset-level emissions data, in which case it would be optional
Miscellaneous	ABS	Consumer Related Structures (Credit Card Receivables, Student Loans, Small Business Loans, Home Equity Loans, etc.) Other structures (e.g. receivables, commodities) not backed by hard assets	**Not included**, as no PCAF guidance is available yet, unless the FI has access to applicable asset level emissions data (small business loans)
	Covered bonds	Public Sector Covered Bonds, Land and Forest Covered Bonds	**Not included**, as no PCAF guidance available yet for public sector financing (except for sovereigns; sub-sovereigns remain out of scope) or for land-based financing

The methodology cannot be applied if the nature of the assets held in the collateral pool is not known, i.e. a look through to the underlying assets is required, as per the PCAF principle of "follow the money". This pertains to both asset class and sector. For the avoidance of doubt, loans backed by hard assets that are also the subject of a guarantee (e.g. U.S. Agency credit guarantees) fall within the scope of the methodology since the structured product investor and not the guarantor has financed the loan.

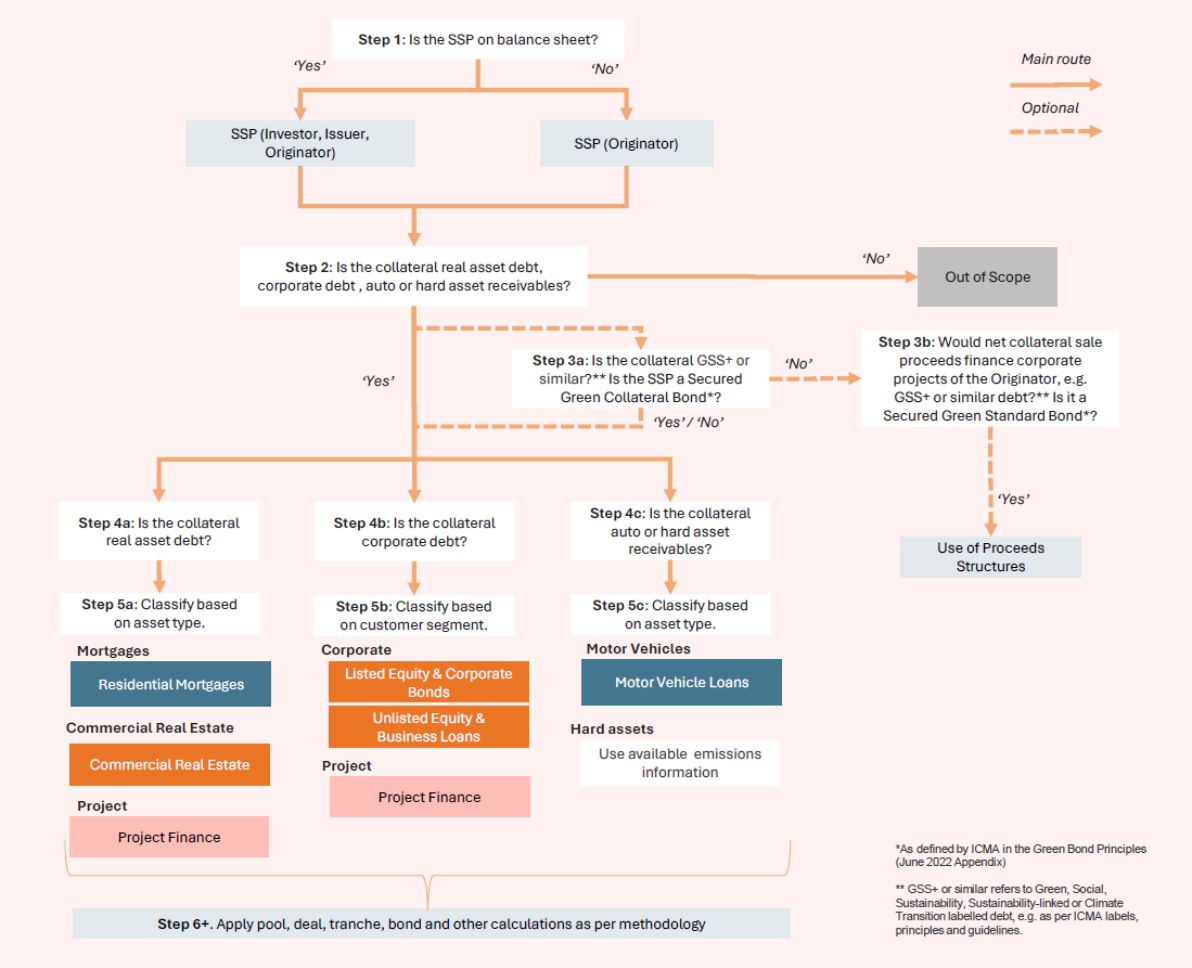
The 'Structural considerations in securitizations and structured products' section later in this chapter provides guidance on approaches for different types of:

- **Structures**: revolving pools, significant/credit risk transfers, synthetics, master trusts, warehouses, Re-REMICs, private transactions (all in scope). repurchase transactions, TBAs (out of scope) and
- **Exposures within structures**: interest/principal only tranches, overcollateralization, risk retention (all in scope), reserve funds, liquidity facilities, hedging, (out of scope), subordinated loans, excess spread, residuals (subject to deal specifics)

Guidance for choosing an approach to calculate financed emissions for Securitizations and Structured Products (SSP)

Figure 5.8-2 provides guidance for choosing an approach to calculate financed emissions for Securitizations and Structured Products (SSP).

Figure 5.8-2. Guidance for choosing an approach to calculate financed emissions for Securitizations and Structured Products (SSP)



Step 1: Is the SSP on balance sheet?

To answer Yes: The SSP exposure is held on the financial institution's (Investor, Issuer, Originator) balance sheet. Issuer special purpose vehicles (SPV) or similar are financial entities, which may hold deal tranches or balances. The Originator or third party may hold loans in the warehouse and deal structuring phase, pending sale as collateral to the issuer. In some structures, such as synthetics and covered bonds, the collateral pool may remain on the Issuer/Originator's balance sheet outside of a SPV. Financed emissions should be calculated and reported accordingly using the SSP methodology.

To answer No: The SSP exposure is not held on the financial institution's balance sheet, e.g. after the Originator has sold the collateral into the SPV but may, for instance, have residual claims. Financed emissions should be calculated and reported accordingly using the SSP methodology.

For more information on SSP and parties involved, see the next section of this methodology. Regardless of whether the SSP is on or off balance sheet, the next step is to determine the nature of the collateral.

Step 2: Is the collateral real asset debt, corporate debt, auto or hard asset receivables?

To answer Yes: The collateral pool securing the SSP exposure consists of identifiable real asset debt (such as commercial or residential mortgages), corporate debt (such as business loans or corporate bonds), auto loans, or other hard asset receivables (e.g., leases or loans secured by physical assets). These types of collateral are within the scope of the SSP methodology, which requires a "look-through" approach to the underlying collateral to determine the appropriate financed emissions accounting. Such assets are currently in scope for Part A of the Financed Emissions Standard and the financial institution should proceed to further classify the collateral type and apply the SSP methodology.

Optionally, consider Step 3 if the deal carries a GSS+ or similar label, before proceeding to, or skip and proceed directly to Step 4.

To answer No: The collateral pool securing the SSP exposure does not include real asset debt, corporate debt, auto loans, or hard asset receivables. Examples include securitizations backed by credit card receivables, student loans, home equity loans, etc. as per the table above. Such assets are currently out of scope for Part A of the Financed Emissions Standard and therefore are not accounted for under the SSP methodology.

Step 3a (Optional): Is the collateral GSS+ or similar? Is the SSP a Secured Green Collateral Bond*?

To answer Yes: The net proceeds finance and/or refinance the underlying assets (the 'collateral') and the collateral backing the SSP exposure is designated as GSS+, i.e. Green, Social, Sustainability, Sustainability-linked or Climate Transition debt, according to recognized standards (e.g., ICMA Green Bond Principles (2022, 2025), ICMA Climate Transition Bond Guidelines (2025), EU Taxonomy, Climate Bonds Initiative Taxonomy and Standard). The SSP is a Secured Green Collateral Bond, as defined by ICMA in the Green Bond Principles (June 2022 Appendix). Such assets are currently in scope for Part A of the Financed Emissions Standard and the financial institution should proceed to further classify the collateral type in Step 4 and apply the SSP methodology.

To answer No: If the collateral is not GSS+, but the answer to Step 2 is 'Yes', the financial institutions should proceed to further classify the collateral type in Step 4 and apply the SSP methodology.

Optionally, consider Step 3b if the deal carries a GSS+ or similar label.

Step 3b (Optional): Would net collateral sale proceeds finance corporate projects of the Originator, e.g. GSS+ or similar debt? Is it a Secured Green Standard Bond*?

To answer Yes: The net proceeds from the sale of the collateral pool are used by the originator to finance corporate projects that are designated as GSS+, i.e. Green, Social, Sustainability, Sustainability-linked or Climate Transition debt, according to recognized standards (e.g., ICMA Green Bond Principles (2022, 2025), ICMA Climate Transition Bond Guidelines (2025), EU Taxonomy, Climate Bonds Initiative Taxonomy and Standard). The SSP qualifies as a Secured Green Standard Bond, where the financing supports specific corporate projects rather than being directly backed by green/social/sustainable collateral. In this case, the financial institution may apply the Use of Proceeds Structures methodology, which accounts for the use of proceeds in financing eligible projects.

Step 4a: Is the collateral real asset debt?

To answer Yes: The collateral pool includes identifiable real asset debt, such as commercial or residential mortgage loans, or other loans secured by tangible assets. These assets are held in the collateral pool and are within the scope of the SSP methodology. The financial institution should proceed to Step 5a and apply the SSP methodology.

Step 4b: Is the collateral corporate debt?

To answer Yes: The collateral pool consists of identifiable corporate debt instruments, such as business loans, corporate bonds, or other debt issued by companies or SSP issuers. These assets are within the scope of the SSP methodology. The financial institution should proceed to Step 5b and apply the SSP methodology.

Step 4c: Is the collateral auto or hard asset receivables?

To answer Yes: The collateral pool includes auto loans or other receivables secured by hard assets, such as equipment leases or loans backed by tangible physical assets. These types of collateral fall within the scope of the SSP methodology, or reported emissions data is available from the Issuer for the collateral. The financial institution should proceed to Step 5c and apply the SSP methodology.

Step 5a: Classify based on asset type

The financial institution should apply a "look-through" approach to the underlying real asset type to determine the appropriate financed emissions accounting, using the corresponding asset class methodologies for real assets.

Step 5b: Classify based on customer segment

The financial institution should apply a "look-through" approach to the underlying corporate debt or loans to determine the appropriate financed emissions accounting, using the corresponding asset class methodologies for the given customer segment.

Step 5c: Classify based on asset type

The financial institution should apply a "look-through" approach to the underlying auto receivables or hard assets to determine the appropriate financed emissions accounting, using the corresponding asset class methodologies for the asset type. For non-auto hard assets, the institution should obtain reported emissions data for the collateral if it intends to use the SSP methodology.

Step 6+. Apply pool, deal, tranche, bond and other calculations as per SSP methodology.

Guidance: Once the collateral type and structure have been identified (real asset debt, corporate debt, auto or hard asset receivables), the SSP methodology requires a multi-level attribution process to allocate financed emissions accurately and avoid double counting.

1. **Calculate asset-level emissions:** Determine the absolute scope 1 and scope 2 emissions of the individual loans or leases in the collateral pool, using the best available data or estimates per asset class guidance.

2. **Attribute emissions to individual loans**: Use collateral attribution factors (CAF) based on current outstanding amounts (COA) and asset values at origination to allocate emissions to each loan within the pool.
3. **Aggregate loan emissions to the collateral pool**: Sum the emissions of all loans to determine the total financed emissions of the collateral pool backing the SSP.
4. **Allocate collateral pool emissions to deal tranches and retained interests**: Distribute the total pool emissions to each tranche of the securitization structure proportionally based on the nominal amount of each tranche relative to the total pool nominal amount. This includes any retained equity or risk retention positions held by the originator or sponsor.
5. **Attribute tranche emissions to investors**: Allocate emissions to investors based on their share of holdings within each tranche, reflecting their economic exposure.

Additional guidance

When the net proceeds of the securitization and structured product finance and/or refinance the underlying assets (the 'collateral'), or the issuance is labelled as a 'Secured Green Collateral Bond' in accordance with the ICMA Green Bond Principles (June 2022 Appendix), this methodology should be applied. If the net proceeds of from the sale of the collateral into the securitization or structured product are intended to be used by the originator to finance and/or refinance specified use-of-proceeds corporate projects, or the issuance is labelled as a 'Secured Green Standard Bond,' using ICMA Green Bond Principles (June 2022 Appendix), the Use of Proceeds Structures subchapter may be relevant.

GENERAL GUIDANCE ON EMISSIONS ACCOUNTING

Securitizations and structured products are complex and involve multiple parties along the structured product investment chain, including:

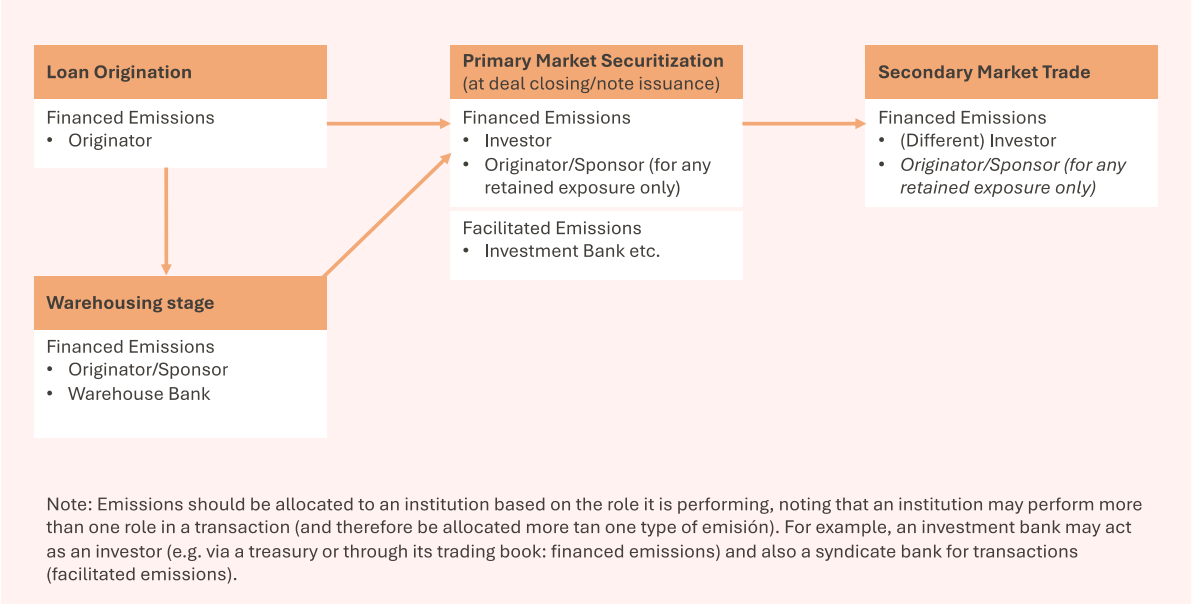
- **Originators:** Originators are often, but not always, FIs who originate and/or contribute assets to the securitization. The originator, sponsor, or original lender will include any assets held outside of the securitization as financed emissions under Part A, and this includes the loans destined for the deal, but pre-securitization. As loans are moved into the SPV, the originator may be able to reduce their financed emissions for the removed assets. Any loans retained by the originator, or in structured deals where there is no true sale to an SPV (such as covered bonds or synthetic securitizations), would be accounted for as financed emissions under Part A. For the sake of consistency, we will use the term "originator" to mean the originator, sponsor, or original lender of the loan(s) in the securitization.
- **Investors**: Investors (including investment banks acting as investors, or other parties participating in the deal as investors) will include any emissions associated with investments in structured products as financed emissions under Part A.
- **Arrangers/Banks/Intermediaries:** Arrangers assisting with the structuring and placement of the investment product at pre-issuance are responsible for most deal support (i.e. structuring advice, investor book, allocation, and roadshows). There are other roles such as underwriters, lead managers, banks, etc. Facilitators should account for emissions related to the transactions they have facilitated, as facilitated emissions under Part B as and when facilitated emissions guidance for this asset class becomes available.

Figure 5.8-3 illustrates how emissions are allocated throughout the loan origination and securitization process. When the loans are originated, the originator accounts for them as financed emissions. If they use a warehousing bank to hold loans until there is sufficient volume to issue a deal, the warehouse bank would also account for the loans as financed emissions for any portion it holds.

The transfer of the collateral pool from an originator to the SPV, and the issuance of bonds by the SPV happens simultaneously at deal closing. Once the bonds are issued and sold (allocated) to investors, the emissions associated with the assets in the underlying collateral pool should be accounted for by the holders of those securities. Investors shall either use financed emissions reported directly by originators or, if this data is not available, look to estimate and report financed emissions using this methodology and the best quality data available. For more guidance on data, see 'Data required and data quality score' section below.

Whether or not the originator needs to continue accounting for the emissions depends on considerations such as the jurisdiction, whether the securitization transaction will be de-consolidated, and if they retain part of the loans or invest in some of the issued bonds. Additional guidance on calculating emissions for risk retention can be found in the 'Structural considerations in securitizations and structured products' section.

Figure 5.8-3. Allocation of emissions (financed and facilitated) throughout the loan origination and securitization process



Note: Emissions should be allocated to an institution based on the role it is performing, noting that an institution may perform more than one role in a transaction (and therefore be allocated more tan one type of emisión). For example, an investment bank may act as an investor (e.g. via a treasury or through its trading book: financed emissions) and also a syndicate bank for transactions (facilitated emissions).

The guidance is focused on the most typical securitization structure, where assets are pooled and transferred to an SPV which issues tranched securities. However, there are various structures (e.g. synthetic securitizations, where the credit risk is transferred but the assets remain on the originator's balance sheet) and structural features (e.g. splitting bond tranches into interest-only and principal-only

strips). Further guidance on how different structure types and structural features are handled can be found in the 'Structural considerations in securitizations and structured products' section.

EMISSION SCOPES COVERED

Investments in structured products would fall under scope 3 category 15 of an FI's emissions inventory. Emissions accounting for a structured product **shall** cover the absolute scope 1 and 2 emissions related to the hard assets backing the underlying collateral of that product. In the same way as the emissions from the assets backing loans fall under scope 3 category 15 of a FI's emissions inventory when sat on their balance sheet, these emissions fall under scope 3 category 15 of a securitization SPV's emissions inventory when the loans are held in an SPV (e.g. as part of a securitization transaction).

Real estate: Emissions accounting **shall** cover the absolute operational scope 1 and 2 emissions related to the energy use of the property financed, on a whole building basis, i.e. energy use includes the energy consumed by the building's occupants and shared facilities. FIs **may** report financed emissions from the construction or renovation of buildings and embodied carbon (scope 3 emissions) if required by the jurisdiction where the FI is located.

Business loans and corporate bonds: Emissions accounting **shall** cover the absolute scope 1, scope 2 and scope 3 emissions of borrowers and investees. Financial institutions **shall** separately disclose absolute scope 3 emissions from scope 1 and 2 emissions of borrowers and investees. Separate reporting allows for full transparency while acknowledging potential double counting.

Auto loans/Leasing: Emissions accounting **shall** cover the annual scope 1 and scope 2 emissions of the vehicles being financed. FIs **may** report scope 3 emissions related to the production of vehicles, delivery of vehicles to buyers, or decommissioning of vehicles after use if required by the jurisdiction where the FI is located.

Other hard assets: Emissions accounting **shall** cover the annual scope 1 and scope 2 emissions of the equipment being financed. FIs **may** report scope 3 emissions related to the production of equipment, delivery of equipment to buyers, or decommissioning of equipment after use if required by the jurisdiction where the FI is located.

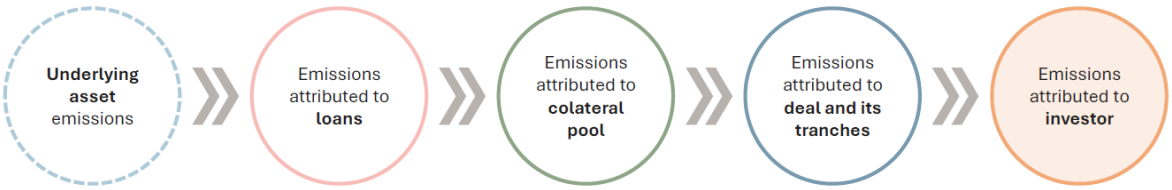
ATTRIBUTION OF EMISSIONS

Emissions accounting for structured products requires consideration of both the hard assets in the collateral pool and the securities created through the transaction. More specifically, the emissions allocated to the securities are derived from the emissions attributed to the collateral pool, which in turn are determined from the emissions of the underlying hard assets backing the loans in the collateral pool. There are, therefore, five steps in the financed emissions attribution to investors:

1. Calculate asset level emissions of the individual loans.
2. Attribution of underlying asset emissions to individual loans in accordance with asset class guidance under Part A, i.e. in accordance with guidance as referenced in Table 5.8-4.
3. Attribution of loan emissions to the collateral pool, effectively a portfolio of loans.

4. Attribution of collateral pool emissions to the bond structure and allocation to each of the deal tranches, as well as to any retained interest, or equity, in the deal.
5. Attribution of tranche emissions to the investor, based on the share of holding relative to tranche size.

Figure 5.8-4. Overall attribution approach



Attribution of Facilitated Emissions to deal arrangers/underwriters should follow the same approach, but apply PCAF guidance under Part B.

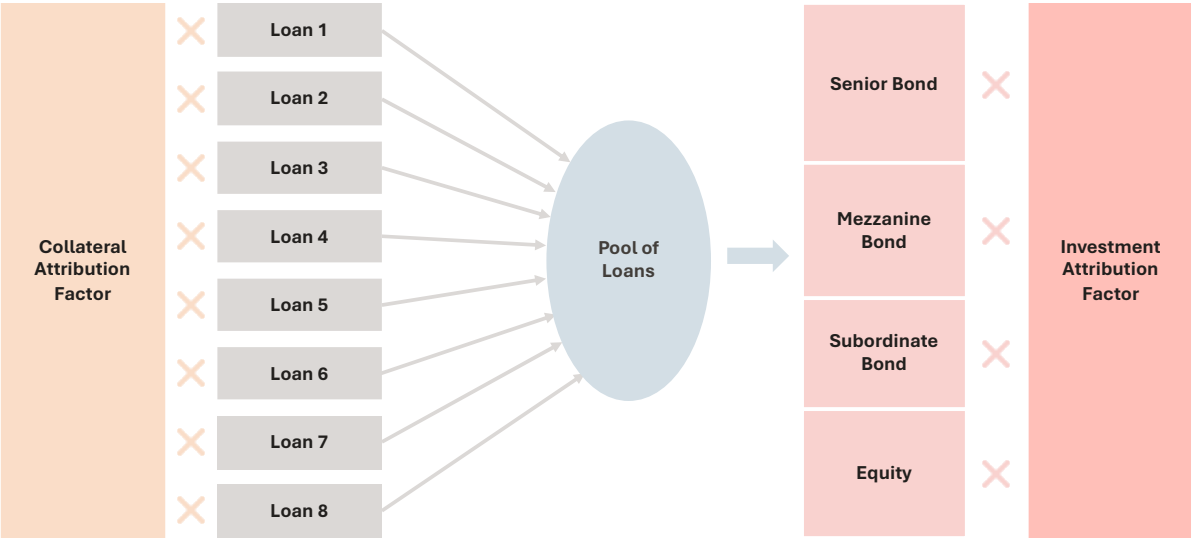
GUIDING PRINCIPLES ON FINANCED AND FACILITATED EMISSIONS FOR STRUCTURED PRODUCT INSTRUMENTS

1. Total financed emissions allocated to the various tranches of a securitization should be equal to the emissions of the financed assets (no double counting between tranches). For these purposes:
   a) tranche means each of the separate elements of the principal liabilities of the securitization (e.g., class of notes, class of loan notes, sub-loans, balance-sheet financed covered bond pool buffer amount / retained senior exposure of SRT transaction, over-collateralization, etc.).
   b) which, when taken together at their nominal amount, equal the nominal outstanding amount of the loans in the pool at the closing of the deal.
2. Total financed emissions allocated to the various tranches of a securitization should be equal to the emissions that would be attributed to the financed assets if they were on the balance sheet of an originator (regardless of whether they are on the balance sheet of the originator or not).
3. Tranches of the securitization are allocated financed emissions where they are (largely) repaid from (either directly or with reference to) the principal receipts of the loans secured by the financed assets.
4. Financed emissions of loans that are securitized but remain on the balance sheet of an originator will be accounted for by both the holders of the securitization tranches and the originator/sponsor, but this apparent double counting is not inconsistent with the general approach to scope 3 emissions.
5. Unless specific tranches are backed by distinct, separately identifiable, pools of assets, individual assets' emissions should not be allocated to specific tranches. If specific tranches are backed by distinct, separately identifiable, pools of assets, emissions from those assets should be allocated to the relevant tranches accordingly.

The 'Structural considerations in securitizations and structured products' section provides more detailed information on different types of exposures within structures and on structural features.

The attribution of asset emissions to the collateral pool and to the investor requires multiple attribution factors.

Figure 5.8-5. Attribution Factors Diagram for Structured Products



1. Collateral Attribution Factors

The collateral attribution factor (CAF) is used to attribute emissions of the underlying hard assets to the loans held in the collateral pool underpinning the investment structure. These factors are asset class specific to Table 5.8-2. All attribution factors reference the current outstanding amount (COA).

Table 5.8-2. General Collateral Attribution Factor formulae

Collateral type	Structure	Collateral attribution factor (CAF)
Real estate	RMBS	$CAF_{Real\ Estate} = \frac{COA\ (Nominal)}{Property\ Value\ at\ Origination}$
	CMBS & CMO	
	Mortgage Covered Bonds	
	Other Property-Backed ABS, MBS, or structured finance	
Business loans and corporate bonds	CLO & CDO	By underlying asset: $CAF_{Business} = \frac{COA\ (Nominal)}{Total\ Equity + Debt}$ $CAF_{Corporate} = \frac{COA\ (Nominal)}{Enterprise\ Value\ Including\ Cash}$ $CAF_{Real\ Estate} = \frac{COA\ (Nominal)}{Property\ Value\ at\ Origination}$
Auto loans	Auto ABS	$CAF_{Hard\ Asset} = \frac{COA\ (Nominal)}{Total\ Value\ at\ Origination}$
Other hard assets	Other hard assets back by ABS	$CAF_{Hard\ Asset} = \frac{COA\ (Nominal)}{Total\ Value\ at\ Origination}$

CAFs should never exceed the value of 1.0. A maximum value of 1 should be applied to avoid artificially creating emissions.

Where possible, FIs (e.g. originator, investor) shall strive to obtain the nominal value (rather than a market value or net present value) of the COA of the loan at the time of GHG accounting to calculate the CAF. Current outstanding amount is the current remaining principal balance outstanding of the loan (or the current balance including accrued interest can be used if the current principal balance is not available). Similar to Part A guidance, the attribution of emissions within securitized products is based on nominal values in order to avoid unintended fluctuation of financed emissions as a result of market volatility.

If the COA cannot be obtained or calculated, the FI may use the nominal original outstanding amount (at the point of securitization) to determine the collateral attribution factor and shall disclose this in emissions reporting. Original outstanding amount (OOA) is the principal amount of the loan at the time of deal closing, i.e. issuance.

Where possible, the asset value at loan origination should be used rather than any more recently updated asset value. There are nuances to this approach in certain structures, e.g. US CMBS/ABS master trusts - see 'Structural considerations in securitizations and structured products' section later in this chapter.

In order of priority or preference, the calculation for the CAF should be:

1. Current outstanding amount (COA) / Asset value at origination (AVO)
2. Original outstanding amount (COA) / Asset value at origination (AVO)
3. Current outstanding amount (COA) / Updated asset value (UAV)
4. Original outstanding amount (OOA) / Updated asset value (UAV)

As a loan pays down, the loan's COA will be different from the OOA, consistent with the PCAF principle of "follow the money". This is often the case at the point the loan is sold into the SPV, i.e. the loan is "seasoned" at deal closing, adjusted for drawdowns, amortization, and other repayments relative to the initial outstanding amount from the time the loan was first originated by the originator. The loan amount at securitization deal closing is the OOA, as described above. Post-closing, as the loan continues to pay down, the collateral attribution factor and financed emissions will evolve accordingly. Consideration should also be given to any drawdowns, if provided for in the terms of the loan, but treatment would depend also on the terms of the securitization.

Box 5.8-1. Note on amortization

Adjusting the outstanding amount for loan amortization captures the reduced level of financing, and increased level of equity, i.e. amortization shifts the emissions from the FIs to the borrower. Real-world decarbonization would come from improvements in energy consumption and/or emissions of the underlying assets. Analysis of change can be used to disaggregate the contributors to changes in financed emissions and/or emissions intensity to isolate real-world impacts.

2. Loan Attribution Factor (LAF)

The collateral pool emissions are the total of attributable loan emissions. The amount of attributed underlying asset emissions factored into collateral pool emissions is proportional to the share of the loan amount held in the pool relative to the total loan amount. For example, if 50% of a loan is contributed to collateral pool A and 50% to collateral pool B, the emissions attributed to the loan are split 50/50 between the two collateral pools. If the full loan is contributed to the collateral pool, the full attributed loan emissions are factored into the collateral pool emissions.

The general formula for loan attribution factor (LAF) is provided below, but as noted above the loan amounts factored in should be updated to COAs for each emissions accounting period to reflect any amortization and/or other capital repayment under the loan.

$$Loan\ attribution\ factor = \frac{Loan\ COA\ (Nominl)\ in\ Pool}{Total\ Loan\ COA\ (Nominal)}$$

3. Tranche Attribution Factor (TAF)

The emissions allocated across all relevant tranches within the capital structure need to match the emissions allocated to the collateral pool. Individual tranche allocations are based on the relative size of the tranches in the deal.

Tranche seniority, or position in the capital structure, does not affect financed emissions as each tranche is exposed to the same underlying collateral pool, and therefore, seniority is not considered in the equations to calculate financed emissions. Additional guidance on how to account for losses and default can be found in the 'Structural considerations in securitizations and structured products' section.

The general formula for tranche attribution factor (TAF) is provided below. As for loans, the tranche amounts factored in should be updated to nominal COAs for each emissions accounting period to reflect any amortization and/or other capital repayment of the tranche.

$$Tranche\ attribution\ factor = \frac{Tranche\ COA_i}{\sum_{i=1}^{n} Tranche\ COA_i} = \frac{Tranche\ COA}{Deal\ COA}$$

4. Investment Attribution Factor

Attribution of tranche emissions to the investor is based on the size of the investor's holding/allocation in the deal relative to the total size of the tranche:

$$Investment\ attribution\ factor = \frac{Tranche\ investment\ COA}{Total\ tranche\ COA}$$

EQUATIONS TO CALCULATE FINANCED EMISSIONS

Where emissions information is available at the loan or collateral pool level, emissions are apportioned across the capital structure (all relevant tranches) corresponding to their relative share of the collateral, as per Table 5.8-3. The financed emissions formula set provides for both single collateral pool structures and structures that represent a portfolio of loan pools (pool of pools).

If a collateral pool attaches to a specific tranche or tranches, these should be treated as separate transactions to allow appropriate attribution of underlying asset emissions. The investor would then need to aggregate the attributed emissions across these transactions to calculate its investment portfolio financed emissions.

Table 5.8-3. Financed emission formulae

Level	Financed emissions (FE)
Loan	$FE_{loan} = \sum_{i=1}^{n} Emissions_{collateral_i} * CAF_{collateral_i}$ See Table 5.8-2. for collateral attribution factors by collateral type. If loans feature multiple types of collateral, each type should be assessed separately to reflect the appropriate collateral attribution factor (CAF).
Collateral pool	$FE_{pool} = \sum_{i=1}^{n} Loan\ attribution\ factor * FE_{loan_i}$ $= \sum_{i=1}^{n} \frac{Loan\ COA\ (Nominal)\ in\ Pool_i}{Total\ Loan\ COA\ (Nominal)_i} * FE_{loan_i}$
Pool of pool (if relevant)	$FE_{PoP} = \sum_{i=1}^{n} \frac{Pool\ COA\ (Nominal)\ in\ Pop_{Deal_i}}{PoP\ COA\ (Nominal)_{Deal_i}} x FE_{Pool_i}$
Tranche	$FE_{tranche} = Tranche\ attribution\ factor_i * FE_{Pool\ (PoP)}$ $= \frac{Tranche\ COA\ (Nominal)_i}{Deal\ COA\ (Nominal)_i} * FE_{Pool(or\ PoP)}$
Deal	$\sum_{i=1}^{n} FE_{tranche_i} = FE_{deal} = FE_{Pool(or\ PoP)}$
Investment	$FE_{Investment} = \sum_{i=1}^{n} \frac{Tranche\ investment\ COA\ (Nominal)_{tranche_i}}{Total\ tranche\ COA\ (Nominal)_{tranche_i}} * FE_{tranche_i}$

While it is possible to calculate an individual investor's holding in the deal without an interim tranche calculation, the methodology is designed to be general, including for structures where tranches may have different features – e.g. a green tranche, or a tranche with a different collateral pool.

FIs shall use the nominal COA at the time of GHG accounting to calculate the financed emissions and, where calculated, emissions intensity. To determine the economic carbon intensity (ECI) of an asset, collateral pool(s), tranche, or investment holding, a FI should divide the relevant financed emissions by the relevant nominal COA (e.g. pool financed emissions ÷ total pool nominal COA).

In certain cases, the financed emissions of the underlying collateral pool might be reported directly. For example, a covered bond issuer might publish an annual report containing the financed emissions. An investor's financed emissions can then be calculated as follows:

$$Investment\ financed\ emissions = \sum_{i=1}^{n} Investment\ attribution\ factor * Tranche\ attribution\ factor * Reported\ emissions$$

If the FI does not have the data required to follow the preferred approach noted above, emissions intensity (e.g. tCO_2e/$M) can be applied to the COA of a tranche or investment to determine the allocation of financed emissions. If this approach is taken it should be transparently disclosed in line with PCAF data quality score guidance.

DATA REQUIRED AND DATA QUALITY SCORE

It is not common for the reported emissions of the assets collateralizing structured products to be available. Thus, it is often challenging for originators to collect actual emissions data for the underlying assets. We expect this effort to progress as originators (and/or any respective data collection teams) are urged to collect any emissions-related data at time of loan origination and provide data in a standardized format to assist with emissions calculations, disclosing any outside sources used for emissions related data provided. Investors are encouraged to engage with issuers to communicate the importance of providing underlying asset data. This will encourage industry-wide data collection, standardization, and enhanced reporting over time to improve emissions accuracy.

In this context, it should be noted that emissions for underlying assets may be estimated in line with relevant PCAF methodologies, and FIs should use the highest quality data available to calculate emissions. FIs should always report the associated data quality score based on the quality and availability of data used or sourced.

- For commercial and residential real estate, data may be available from various external sources and commercial databases that can be considered for building emissions estimates as outlined in Part A subchapters 5.4 and 5.5. This may include known building characteristics (building type, location, floor area, units), energy consumption/use, energy sources, renewable energy use, energy labels/scores, location-specific statistical data, supplier-specific data, etc.
- For motor vehicle loans and auto collateral, specific vehicle details (type, year, make, model, trim, fuel type), actual vehicle fuel consumption or actual vehicle distance traveled must be known to determine the actual vehicle emissions. As detailed in Part A subchapter 5.6, emissions can be estimated using vehicle efficiency data from official statistical data sources, and by estimating distance traveled based on government-supported data sources that provide local/ provide geography-specific statistical data on average vehicle distance traveled. PCAF's web-based emission factor database provides emissions factors per vehicle type for a large set of geographies.

Given the lack of publicly available data and the complexity of estimating emissions for hard assets, originators are urged to provide all applicable asset-level data (inclusive of but not limited to the details noted above) to assist in calculations of financed emissions. In cases where it is not possible to provide loan-level data (which is the preferred approach), it is still acceptable to provide stratified data on the collateral pool, which can support emissions estimation (e.g. industry sector, property type, etc.) using loan amount. Originators are also strongly urged to begin additional data collection processes with the borrower at loan origination and begin standardizing the ongoing reporting of this data. Over time, more relevant data will be collected and should be passed to investors for more accurate emission calculations.

When assessing the emissions of these assets, it's necessary to distinguish between asset types where emissions data is:

- available directly from the originator/sponsor
- able to be estimated using PCAF's emission factor databases (and any future emission factor databases provided by PCAF),
- available or estimated using an external third-party data source, or
- not currently available for the asset type.

The accessibility and accuracy of emissions data can vary significantly, and access may be dependent on where the user sits in the investment chain. As regulatory and industry best practice disclosure standards evolve, it is expected that originator/sponsor will provide most emissions data with the highest data quality, as they are best positioned to obtain or estimate this information.

FIs should use the highest quality dataset available and evaluate new data sources originator/sponsor regularly. Nonetheless, there may be cases where the only underlying data available for a given structured product investment is the institution's investment amount and the structured product investment type. Whenever data is estimated, the FI should always take the most conservative approach and outline the approach in proper disclosures. For example, if residential property type is not provided in an RMBS transaction, a FI should assume all property types in the collateral pool are backed by single-family detached homes (or the most emissions-intensive property type equivalent) or disclose that emissions calculations are not available due to missing data. The level of data quality used should always be reported using PCAF's data quality score.

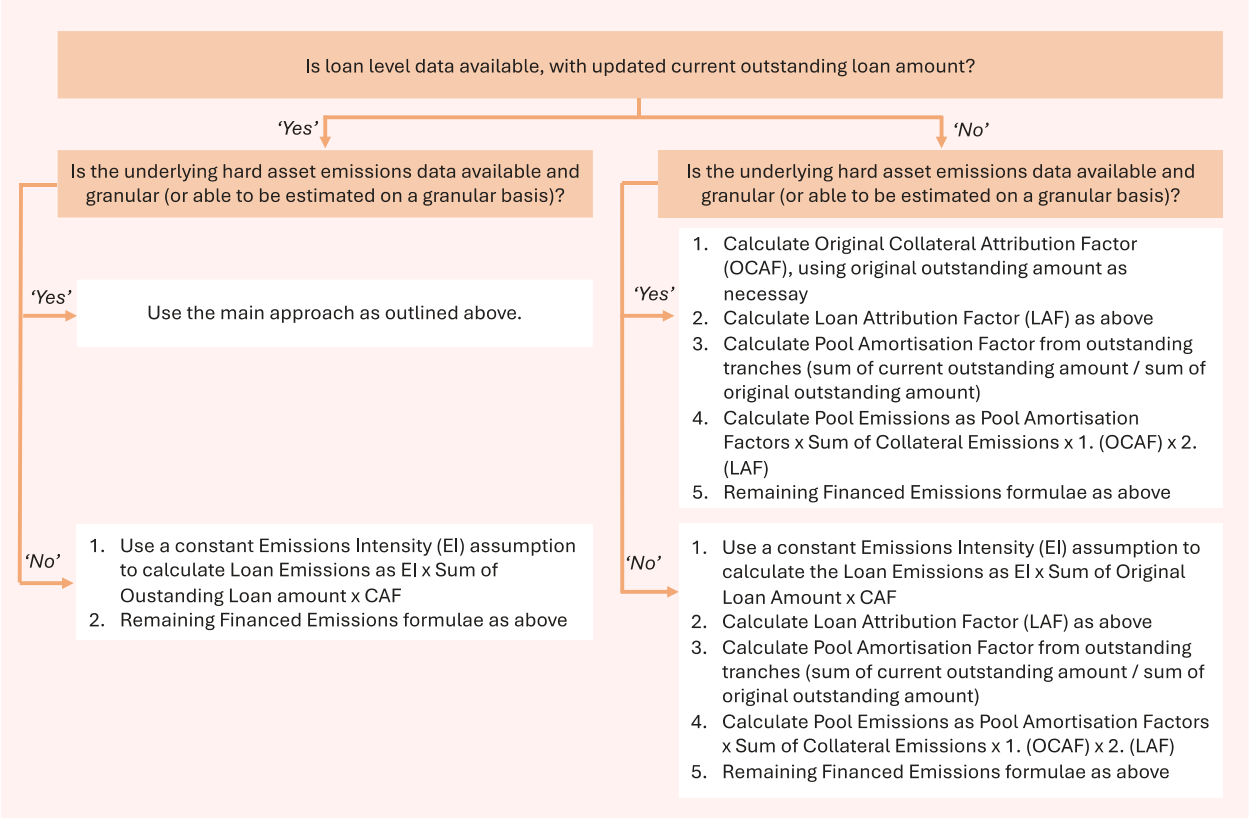
It is understood that there remains a lack of consistent and granular data needed for the most accurate emissions calculations for all assets that collateralize securitized products. There may also be challenges in accessing detailed information on the underlying assets, when not directly provided by the issuer or when information is private. Emissions estimates can and should still be calculated using the most granular level of data available. Either using data provided by the issuer directly, or in combination with third party data.

Using Auto ABS as an example. A typical loan tape will have vehicle year, make, model, and location, but will not have detailed data like mileage, or private data like VIN (vehicle identification number). FIs can still calculate emissions estimates using the EXIOBASE or CEDA databases. In the U.S., government websites such as www.fueleconomy.gov and www.epa.gov have emission calculators where users can input vehicle details and obtain emissions estimates. However, issuers, at time of loan origination, are encouraged to map each unique VIN to EPA data to obtain the most accurate emissions estimates and provide this data as part of the loan level data. In the case where there is not an exact match, regional averages may be used and reported as such. Some Auto ABS issuers in Australia are already providing loan level emissions data. This should encourage uptake in other regions like UK and U.S.

For US RMBS, additional external data sources may include U.S. state level emissions from www.eia.gov, and residential housing information available www.census.gov, as examples.

This method assumes that original and current outstanding loan amounts are available at the collateral pool level. However, this may not be the case, in which case a pool amortization factor or constant emissions intensity can be used to estimate tranche-level, and investment-level, emissions metrics, as per Figure 5.8-6.

Figure 5.8-6. Structured products data quality decision tree



To encourage industry-wide improvement in the availability and usage of best-in-class data, PCAF provides **PCAF data quality scores** in Part A of the Standard which should be referred to for the underlying hard assets in the structured product. The structured products data quality decision tree can be calculated based on a weighted average by the COA of the underlying assets (mortgages, business loans, leases, etc.).

Given the complexity of estimating emissions for all hard assets, originators are strongly encouraged to provide emissions, and emissions-related data, at the loan (or, if not possible, pool) level to create more standardization in downstream emissions reporting. This will help improve data quality, standardization, and ongoing reporting.

ASSESSMENT BOUNDARY

The assessment boundary for emissions is limited to the assets in the collateral pool of the deal.

For the avoidance of doubt, this methodology would also apply to structured products labeled 'green' or similar, e.g. a green CMBS. The methodology should be applied so that the financed emissions reflect the collateral pool composition. Where the hard asset(s) collateralizing the structured product include a "green" or "sustainable" attribute (such as, for example a LEED Platinum certified office building), FIs could also incorporate guidance, as applicable, from the method on Use of Proceed Accounting (subchapter 5.7) and the supplemental guidance on Financed Avoided Emissions and Forward-looking Metrics.

Where deal structures allow for a changing collateral pool, the composition of the pool at the time of reporting should be reflected in financed emissions, using the latest available data on pool composition available at the time of reporting. Emissions attribution showing the drivers of change over the reporting period could be used to help explain changes in financed emissions due to changes in the collateral pool composition. More information on different types of structures and structural features is provided in the 'Structural considerations in securitizations and structured products' section.

FIs **shall** account for and disclose financed emissions from structured products as outlined in this methodology. Given the breadth of the asset class, FIs can deploy a phased implementation, starting with sectors or regions where underlying data is more readily available or able to be estimated, for example RMBS, CMBS, CLOs, and auto ABS in certain areas. FIs **shall** similarly include private asset-backed securities. Originators are strongly encouraged to report emissions from the underlying hard assets in structured product pools given their access to underwriting information. Investors **should** use emission data from originators or estimate such emissions when not available. FIs **should** calculate and disclose both financed and facilitated emissions of all structured products held at the time of reporting, noting that the point in time would depend on the deal reporting cycle and the FI's reporting cycle.

LIMITATIONS

Results depend on data quality

Many assumptions must be made to calculate the emissions of hard assets if emissions are not reported. Even though the calculation method does not differ greatly, different data sources can yield different results—for instance, when average energy consumption data is replaced by actual consumption data from utility companies. If deals are repackaged (e.g. a structured product deal invests in the bonds of a securitization), data sourcing and estimation might be further complicated. For existing deals which do not already provide for emissions tracking and reporting, it is unlikely that such information would be provided under the terms of the bonds. FIs should always report on any data assumptions made and external data sources used in estimating emissions. For transactions where underlying data is not available, FIs are encouraged to disclose the challenges they face as well as their approach to future disclosures.

Country-specific assumptions

Some country-specific adjustments will need to be made to make the calculation applicable depending on the data availability and standards in each country. For example, the variations across countries in their

systems of categorizing the energy efficiency of real estate properties require a tailored approach for optimal accuracy in calculations (EPC A in the United Kingdom is not the same as EPC A, or EPC A++++ across some European countries). In the U.S., there are privacy concerns which may limit access to residential data at the loan level, but pool level stratified data (geography and property type) are available and can be used to estimate emissions calculations.

DOUBLE COUNTING

Double counting, which occurs when GHG emissions are counted within the financed emissions calculation of one or more institutions, should be avoided as much possible. However, double counting will occur across the different scopes of emissions from loans and investments when a financial institution invests in, or finances, stakeholders that are in the same value chain. In this sense, the PCAF standard does not represent a system-wide or global view of total emissions but rather measures the carbon footprint of the loans and investments held on the balance sheet of each financial institution in the value chain. This form of double counting cannot be avoided, but it can be made more transparent by reporting the scope 1 and 2 emissions of loans and investments separately from their scope 3 emissions.

The securitization of different asset classes may result in the transfer of credit risk exposures from originators to investors. The structuring of these products potentially causes double counting of financed emissions in different areas e.g. through associating the same emissions with originators, issuers, investors, arrangers, etc.

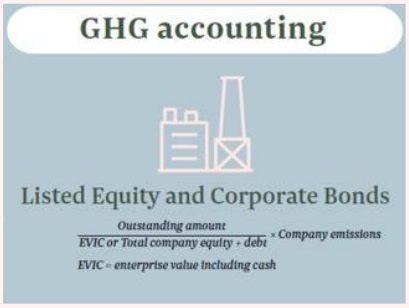
The treatment of GHG emissions follows the accounting treatment that applies to the securitization transaction (such as US GAAP or IFRS). Under US GAAP, the treatment of securitized loans on the balance sheet of the loan originator depends on whether the securitization meets the criteria for derecognition. If the securitization transaction qualifies for derecognition, the loans are removed from the balance sheet of the loan originator.

IFRS requires an assessment of whether the transferor has transferred substantially all the risks and rewards of ownership. If the transferor retains the risks and rewards, the asset is not fully derecognized and the originator will continue to report the securitized assets on balance sheet and account for the GHG emissions accordingly. Investors will also be required to account for the emissions attributed to the bond holding reported on their balance sheet. For avoidance of doubt, there are no financed emissions attributed to the SPV's scope 1 or 2 in securitization structures given the nature of the SPV – financed emissions reflect the collateral securing the issued bond tranches.

Double counting in relation to the holders of listed equity and corporate bonds of an originator should not occur if both the securitized assets and associated securitization liabilities are included on the originator's balance sheet. For a visual example, see Figure 5.8-7. In this case, the securitization debt in the EVIC denominator serves to reduce the volume of emissions allocated to equity and corporate debt as these form part of the originator's overall on-balance sheet emissions. If the emission intensity of the securitized assets is different from the weighted average asset emissions intensity on the originator's balance sheet, this may result in a small difference in the calculation of the carbon intensity of the listed equity and

corporate bond per GHG accounting. Examples of accounting for a specific use of proceeds instrument (e.g. a securitization) and adjustments are provided in the subchapter on Use of Proceeds Structures.

Figure 5.8-7. If the assets are already on the corporate balance sheet, are we double counting by also allocating emissions to securitization tranches?



Illustrative example:

EVIC Components (£bn)	
Market cap. of shares	35
Book value securitised debt	5
Book value corporate debt	330
Customer Deposits	500
Total	870

Scope 3 Emissions (from balance sheet assets) $ktCO_2$	
Securitised mortgages	90
Un-securitised mortgages	5100
Other consumer loans	1540
Customer Deposits	1000
Total	7,730

Carbon Intensity of Listed Equity and Corporate Bonds per GHG = $\frac{\text{Company emissions}}{\text{EVIC or Total company equity + debt}} = \frac{7{,}730}{870} = 8.89\ tCO_2/£m$

But carbon intensity of securitised debt = $\frac{90}{5} = 18.0\ tCO_2/£m$

and therefore actual carbon intensity of everything *excluding* securitised debt = $\frac{7.730 - 90}{870 - 5} = 8.83\ tCO_2/£m$

To support the guiding principle that double counting should not arise within structures, the 'Structural considerations in securitizations and structured products' section gives guidance on the appropriate treatment for various structural nuances where questions on double counting could otherwise arise, such as where a tranche is split into interest only (IO) and principal only (PO) strips or under a repurchase agreement on a structured product.

STRUCTURAL CONSIDERATIONS IN SECURITIZATIONS AND STRUCTURED PRODUCTS

Different types of structures

The standards for structured products started from considering a simple (but very common) structure whereby financial assets, backed by hard collateral, are sold to an SPV which issues structured notes. This may or may not result in the removal of those assets from the balance sheet. However, in line with the "follow the money" approach, this is not relevant for the allocation of financed emissions to the structured notes.

That said, there are many other ways of creating structured products; whilst the principles remain the same, guidance on some of the more common alternative structures is given in the table below. This guidance should be reviewed alongside the collateral type descriptions in Table 5.8-4. to identify in-scope transactions.

Table 5.8-4. Common alternative structures and their treatments

Structure type	Description	Treatment
Static vs. revolving pool	**Static**: with very limited exceptions, no assets are removed or added to the transaction's collateral pool other than through repayment and redemption of the loan **Revolving**: subject to eligibility criteria, new assets may be purchased into the collateral pool, typically using the principal redemption receipts from assets already in the pool instead of using them to repay ABS notes	These should both follow the stated methodology, in each case using the most recently updated details of the collateral pool at the point of emissions accounting.
Significant risk transfer / credit risk transfer	Transactions designed to move asset risk off banks' balance sheets to reduce capital requirements	This should follow the stated methodology. Both funded and unfunded tranches count as tranches under the methodology and emissions should be allocated to a tranche with reference to the proportion of the collateral pool to which it has credit exposure.
Synthetic transaction	Transaction where credit risk transfer is achieved through a credit default swap referencing the asset pool and with no sale of assets taking place	This should follow the stated methodology. The on- or off- balance sheet treatment of the assets by the seller is not relevant for the allocation of emissions to the securitization.
Warehouse	Funding trade whereby a committed facility amount is utilized over time to fund a growing portfolio. Typically structured with a senior commitment and a junior (and possibly mezzanine) tranche.	This structure should follow the principles of the methodology. The total emissions of the asset pool at the point in time should be allocated to the drawn amounts of the various tranches (senior loan/facility, any mezzanine participation and the junior exposure) that are used to fund the loan origination.
Repurchase agreement (and master repurchase agreements)	Borrowing agreement to sell securities and repurchase them at a higher price on a later date	These sit under the separate derivative guidance when it becomes available. If Party A holds a securitization position and enters into a repo trade on the security with Party B: Party A should account for the financed emissions allocated to that securitization but not Party B (to avoid double counting).
Master trust	A securitization which issues multiple series of securities, backed by a pool of assets held on trust, whereby each series has an interest over the trust's entire asset pool. In addition to the different series of securities there is typically also a "seller share" (often used as	**Revolving Portfolio**: financial assets amortize over time (loans) and issuance of new securities typically requires an addition of further assets to the trust (or a reduction in the seller share) This should follow the stated methodology, with the seller share treated as a tranche for the purpose of allocating the financed emissions of the pool.

	regulatory risk retention) which is held by the seller/sponsor and which represents a retained interest in the asset pool. Two separate approaches to emissions allocation are laid out for different asset scenarios	**Appreciating Assets:** value of underlying hard assets increases over time (e.g. commercial property) and new securities can be issued by creating an additional loan within the structure against the existing hard assets. This re-levers the transaction based on an updated valuation of the existing hard assets. A master trust with a structure that can be re-levered should treat each new issuance as a refinancing of the entire structure. PCAF guidance for mortgages is to use the property value at loan origination and, where that is not feasible, the latest available property value and fixing this value for the following years of GHG accounting (for a consistent denominator). The guidance also recognizes that if a loan on a property is refinanced, there will be a new loan, likely backed by an updated valuation, with emissions attributed to the new lender. After the new issue (the structure refinancing), the total value of the hard assets used in the collateral attribution factor should reflect the latest hard asset valuation(s) and all tranches (pre-existing securities PLUS newly issued securities PLUS seller share) should be included in tranche attribution factor calculations. This will likely result in the emissions intensity of an existing tranche reducing at the point of a new issuance: see worked example.
Re-REMIC (and other re-securitizations)	Re-REMICs (re-securitization of Real Estate Mortgage Investment Conduit) and other re-securitizations have, instead of the loans outlined above, a securitized tranche or tranches in the deal collateral pool	This structure should follow the principles of the methodology. The total emissions of the re-securitization collateral pool should be calculated by i) decomposing the collateral pool into its underlying structured products, ii) applying this methodology to each of those structured products to calculate the emissions of the tranche included in the re-securitization collateral pool, iii) aggregating emissions of all collateral pool exposures to reach a total emissions value for the re-securitization collateral pool, and iv) applying this methodology to allocate collateral emissions to the tranches of the re-securitization
TBAs	A To-Be-Announced (TBA) is a forward-settling contract to purchase an MBS which is entered	Until the point that the investor takes delivery of the underlying MBS (all the time they roll the TBA), this is out of scope of this methodology; it may sit under the

	into before the details of the underlying pool are known.	separate derivative guidance when it becomes available. If the investor settles the TBA and receives an MBS, this methodology will then apply.
Private Transactions	Transactions with no broad marketing and placed with a limited set of investors (maybe bi-laterally agreed)	This should follow the stated methodology. Similar pool-level information is likely to have been provided to the investor as with a public transaction for them to complete their investment analysis; and hard asset exposure sits within the investment in the same way as in a more broadly distributed transaction.

Figure 5.8-8. Master trust: appreciating assets – worked example

Master Trust: Appreciating Assets – worked example

Trust: Asset Pool

- Secured Loan Notes Outstanding: $910m (incl. Seller Share)
- Hard Collateral Value: $1.3bn
- Hard Collateral Emissions (tCO_2e): 50,050
- Loan Note LTV: 70%

Series 1 Loan Note	Series 2 Loan Note	Series 3 Loan Note	Seller Sh. Loan Note
Series 1 AAA ($192m)	Series 2 AAA ($192m)	Series 3 AAA ($224m)	Seller Share ($150m)
A ($28.8m)	A ($28.8m)	A ($33.6m)	
BBB ($19.2m)	BBB ($19.2m)	BBB ($22.4m)	

	Financed Emissions
Collateral Attribution	50,050 x 910 / 1,300 = 35,035
Tranche Attribution (Series 2 AAA)	35,035 x 192 / (192+28.8+19.2+192 +28.8+19.2+224+33.6+22.4+150) = 7,392
Emissions Intensity (tCO_2e/$m)*(Series 2 AAA)	7,392 / 192 = 38.5

1 year later

- Hard collateral assets have increased in value by $0.2bn
- Additional note series issued and on-lent to the trust, secured by the hard collateral assets (maintaining the same LTV)

Trust: Asset Pool

- Secured Loan Notes Outstanding: $1,050m (incl. Seller Share)
- Hard Collateral Value: $1.5bn
- Hard Collateral Emissions (tCO_2e): 50,050
- Loan Note LTV: 70%

Series 1 Loan Note	Series 2 Loan Note	Series 3 Loan Note	Series 4 Loan Note	Seller Sh. Loan Note
Series 1 AAA ($192m)	Series 2 AAA ($192m)	Series 3 AAA ($224m)	Series 4 AAA ($192m)	Seller Share ($50m)
A ($28.8m)	A ($28.8m)	A ($33.6m)	A ($28.8m)	
BBB ($19.2m)	BBB ($19.2m)	BBB ($22.4m)	BBB ($19.2m)	

	Financed Emissions
Collateral Attribution	50,050 x **1,050** / **1,500** = 35,035
Tranche Attribution (Series 2 AAA)	35,035 x 192 / (192+28.8+19.2+192 +28.8+19.2+224+33.6+22.4+**192+28.8+19.2**+50) = **6,406**
Emissions Intensity (tCO_2e/$m)*(Series 2 AAA)	**6,406** / 192 = **33.4**

Note: whilst the emissions intensity of the investment (tCO_2e/$m) has changed, the total emissions of the building (tCO_2) remains constant.

Different types of exposures within structures

In a simple transaction structure, the total original nominal amount of the structured bonds is equal to the sum of the closing loan amounts in the pool. Allocating emissions across these tranches is straightforward, following the methodology above, and does not generate any double counting. However, there are numerous additional ways of having exposure to securitization and the table below seeks to give guidance on how these should be treated for allocation of financed emissions purposes.

Table 5.8-5. Alternative exposure types and their treatment for allocation of financed emissions

Exposure type	Description	Treatment
Interest only / principal only tranches	Most bonds combine a contractual interest payment (linked to the outstanding bond amount) and a right to principal repayment. These cashflows can be split into two independent streams to create two different securities: an interest-only/IO strip and a principal-only/PO strip. The contractual payments on the IO are based on the outstanding balance of the PO.	Under the methodology, calculating emissions for the combined security is straightforward. It is logical then for an IO/PO structure to allocate the emissions for the combined security to the two strips throughout the life of the relevant tranche. To ensure consistent measure over time, not impacted by extraneous market movements, the IO/PO attribution is based on the relative values of the two strips at deal close: IO tranche FE = Financed Emissions$_{\text{whole tranche}}$ X "Total IO Issuance Proceeds" /"Total IO + PO Issuance Proceeds" If Issuance Proceeds are not an available data point, FI's should use the Fair Value, or, if not available, another appropriate structural split data point, in each case from the issuance documentation. Note: the treatment outlined above is relevant only for split tranches where payments on the IO reference the PO, Other IO structures, which are not linked to a PO note, are covered under "X-notes (senior & subordinated), excess spread and residuals" within this table.
Reserve funds	A cash amount either funded at closing of the transaction or trapped from excess funds (or a combination) to provide credit and liquidity support to the transaction	Out of scope of this methodology. It may be considered that provision of the funds is necessary to cover certain risks specific to the transaction (e.g., risk of set off or liquidity shortfalls), in which case this could be covered in an evolution of the Facilitated Emissions standards.
Liquidity facilities/funds	Either a contractual facility commitment or a fund (funded at closing of through trapped funds) to provide additional liquidity to the transaction	Out of scope of this methodology. It may be considered that provision of the facility/funds is necessary for the transaction to occur, in which case this could be covered in an evolution of the Facilitated Emissions standards.
Hedging instruments	Swaps, caps and other derivative instruments entered into by the securitization issuer to hedge its exposure to foreign currency exchange rates and or interest rates	Out of scope of this methodology. Likely covered in an evolution of the Facilitated Emissions standards.

Over-collateralization	The nominal value of loan collateral within the pool that is additional to the nominal value of the issued notes (i.e. not needed to repay notes if there are no losses in the pool) For the avoidance of doubt: this section applies only to over-collateralization in the form of additional loan collateral (with associated emissions) – not to cash or cash-like assets.	To avoid over-allocating emissions to notes (i.e. from the loans they have financed plus those of the overcollateralization) the overcollateralization should generally be seen as a "virtual" tranche of the transaction for the purposes of this methodology. When calculating the attribution factor, the current outstanding loan amount of the overcollateralization (Loan COA of the total pool MINUS the COA (nominal) of the other tranches) should be used as the COA (nominal) of the overcollateralization tranche. In some structures, the financing for overcollateralization, e.g. sub-loan principal, is repaid from revenue funds and therefore amortizes faster than the assets that form the overcollateralization. By designating the tranche value of the overcollateralization as being the current loan value of the overcollateralization (rather than the current nominal value of the sub-loan), the other tranches are not over-allocated emissions. This could create a situation where overcollateralization emissions are allocated to a sub-loan that has repaid – but there should in this case be an exposure held somewhere (assumed to be with the sub-loan lender) which represents rights to those assets. For structures where a junior or equity tranche (e.g. CLOs) would benefit from the proceeds of overcollateralization, the COA (nominal) of the relevant tranche should be calculated, and allocated emissions, as outlined in the first sub-paragraph above.
Subordinated loans	Loans provided to the securitization issuer which can have varied use of proceeds e.g. funding reserve or liquidity funds, paying upfront transaction costs, purchasing overcollateralization	The purpose of a subordinated loan should be considered when deciding whether or how to allocate financed emissions. E.g. if 60% of the sub-loan is used to fund overcollateralization (in-scope) and 40% to fund a reserve fund then the emissions from the overcollateralization are allocated to the sub-loan holder and the reserve fund is out of scope.
X-notes (senior & subordinated), excess spread and residuals	Notes or certificates representing rights, or simply rights, to excess cashflows (i.e. not contractually linked to the value of any note as	Out of scope of this methodology. Note: if a residual exposure includes exposure to principal receipts e.g. through funding over-

	an IO would be), rights to repurchase the pool etc.	collateralization, this should follow the approach for over-collateralization as outlined above.
Risk retention	Many regulatory frameworks governing securitization require nominated party(ies) to a transaction, "Retention Holder(s)" (typically loan originators or transaction sponsors), to have an alignment of interest with investors, or "skin in the game". This is achieved through regulatory risk retention, which may be structured as an obligation to retain: an amount of loans that would otherwise have been securitized, participation in each of the loans that are securitized, or a proportion of the bonds issued.	**Risk retention as loan portfolios or loan participations held on balance sheet:** emissions should be calculated as financed emissions in line with PCAF Part A.
		Risk retention as issued bonds held on balance sheet: emissions calculations should follow the stated methodology for securitized products.
		Risk retention as issued bonds subject to a financing structure: whereby financing is provided for the retained bonds – often in the form of a repurchase agreement – with the economic risk of the bonds remaining with the Retention Holder. In all cases, the Retention Holder should continue to account for emissions associated with the retained bonds in line with the stated methodology for structured products. This is in line with the guidance on repurchase agreements above; the repo counterparty does not need to account for the emissions. This is also consistent with the guidance for SRT, where full transfer of economic risk results in transfer of financed emissions. In situations where a repo counterparty sells the risk retention bonds into the market, the purchaser of those bonds will also account for the financed emissions of their holding in accordance with this methodology. This will result in double counting of the emissions relevant to the risk retention bonds being accounted for by both the Retention Holder and the subsequent bond purchaser. However, as with other areas of overlap, this double counting is acknowledged, and not inconsistent with the general approach to scope 3 emissions.

Principle loss and default

Principle deficiency ledgers and write-downs

In a "perfect world" as assets in a securitization repay, the tranches are repaid by an equivalent amount and when all the assets have repaid, all the tranches are repaid too. At all times there is a balance between the assets and the tranches that funded them. When losses are crystalized on the assets and there is no

principal cash to pay down the tranches to maintain the balance, this can be dealt with using a principal deficiency ledger (PDL) or principal write-downs.

Using a PDL, losses are recorded on a principal deficiency ledger (first to the most junior tranche and then reverse-sequentially). Any excess revenue funds are allocated to clear the PDLs and diverted to principal funds to pay down the tranches. Typically used in transactions with granular assets pools that generate excess spread (e.g. mortgages, consumer loans). The nominal value of the tranche does not change but, if insufficient excess revenue is available to clear the PDL by the end of the deal, the tranche will be repaid in an amount equal to the nominal value less the PDL.

Other transactions (often where there is no excess spread or where exposures are so concentrated that a loss is unlikely to be made good e.g. with commercial real estate) may contain a principal write-down mechanism.

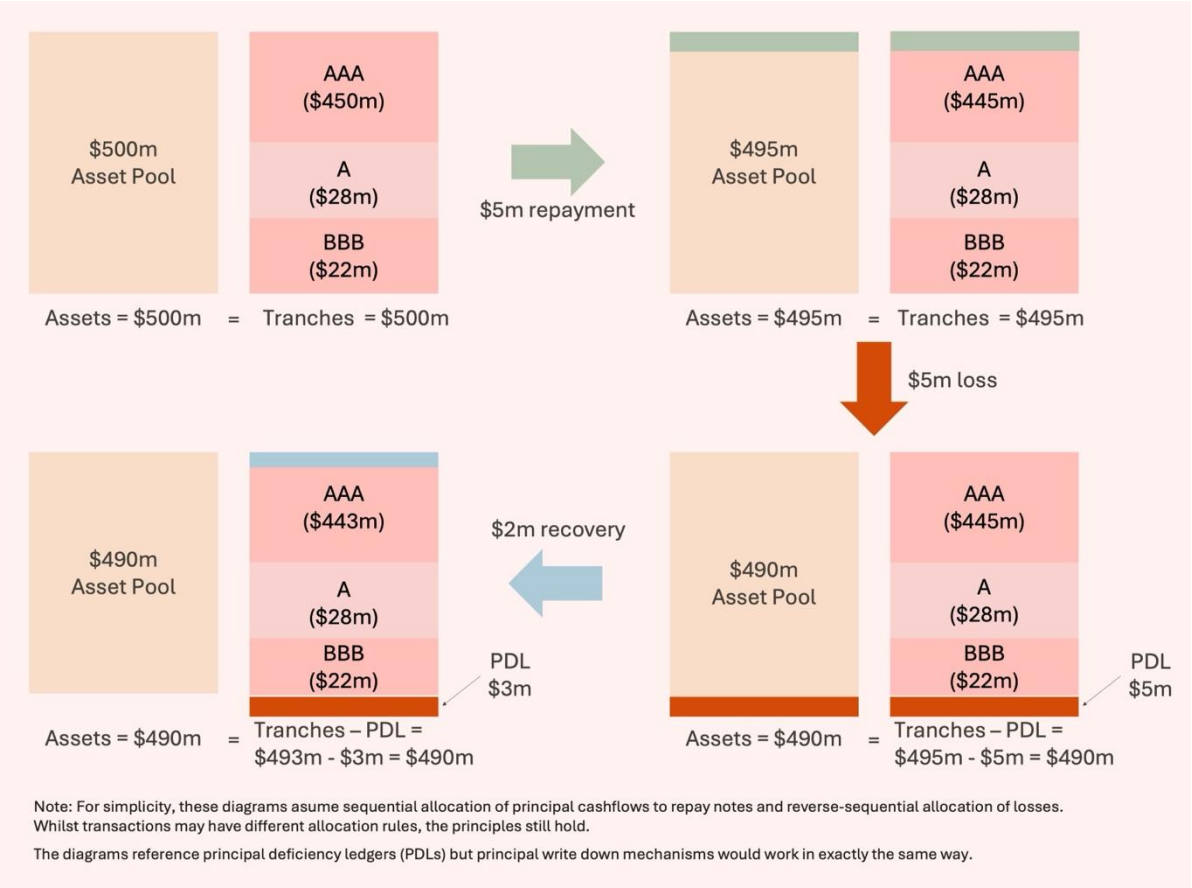
This is a loss being recorded against the tranche and the mechanics can work in a few ways:

1. Principal write-down is recorded against the tranche (shown in investor reports) and loss, once recognized, will not be recovered. Tranche will be repaid in an amount equal to the nominal value less the principal write-downs.
2. Principal write-down is recorded by a reduction in the bond's factor (with no associated payment) and loss, once recognized, will not be recovered. Tranche will be repaid in an amount equal to the nominal value (which, because of the factor reduction, incorporates write downs).
3. Principal write-down is recorded against the tranche (shown in investor reports) but may be recovered over time. Tranche will be repaid in an amount equal to the nominal value less the principal write-down net of any recoveries.
4. Principal write-down is recorded by a reduction in the bond's factor (with no associated payment) and any allocated recoveries will be used to increase the bond's factor (again with no associated payment). Tranche will be repaid in an amount equal to the nominal value (which, because of the factor amendments incorporates the write down).

Ideally, COA (Nominal) used in any attribution calculations should be net of losses allocated to the tranche. This ensures that the emissions of the remaining assets are allocated across the correct nominal value of tranches and avoids the emissions intensity reducing. Since it will be excess spread (rather than any repayment of principal used to finance the hard assets) that is used to make up allocated losses, these allocated loss amounts are not financing hard assets and should not be allocated emissions.

However, PDLs or principal write-downs not recorded via factor changes may be difficult to obtain systematically and in the absence of this, use of the COA (nominal) unadjusted for any loss allocations is acceptable. Additionally, some transactions apply amounts to PDLs prior to crystallization of loss such that they act as a type of provisioning mechanism. In these cases, where loans/assets have not been removed from the pool but the tranche has been written down (via the PDL), the COA (nominal), unadjusted for any loss allocations, should also be used.

Figure 5.8-9. Principal deficiency ledgers and write-downs – worked example



Defaults

In the event of a loan default, FIs shall use the loan's COA and the asset value at origination (subject to data availability as noted above) to calculate emissions until the loan/asset is removed from the collateral pool.

- At the point where the asset is sold, the emissions will transfer to the new owner and the loan is repaid/written off.
- If, as part of a foreclosure process, the legal ownership of the hard asset is transferred to the SPV prior to eventual liquidation, emissions should be calculated using the loan's COA (as at default if no longer updated) and the hard asset emissions should still count as financed emissions, and not scope 1 or 2 emissions of the SPV.
- Regardless of whether the asset is sold at a discount, or premium, FIs will use asset value at origination, and not any updated valuation, to calculate emissions, consistent with this methodology.
- If the loan defaults after partial paydown, emissions are still calculated using the loan's COA and the asset value at origination.

Sovereign debt

PCAF®
Partnership for
Carbon Accounting
Financials

5.9 Sovereign debt

ASSET CLASS DEFINITION

This asset class includes sovereign bonds and sovereign loans of all maturities issued by a national government in domestic or foreign currencies. Both sovereign loans and bonds lead to the transfer of funds to the country, which in turn creates a debt obligation to be repaid by the borrowing country.

Sovereign debt is typically issued by the central government or treasury. In some countries, central banks issue debt on behalf of the sovereign. In those cases, exposure to central banks is in scope of this asset class and should be assigned the emissions of the respective sovereign.

It is challenging to extend this methodology to sub-sovereign and municipal counterparties due to very limited data availability and because these counterparties are not directly subject to international GHG emissions inventory standards (e.g., by the United Nations Framework Convention on Climate Change [UNFCCC]). Therefore, these counterparties are not explicitly part of this asset class. The methodology and guidance to calculate financed emissions from sub-sovereign debt are covered in the Sub-sovereign Debt chapter (subchapter 5.10)

In terms of covering supranationals – their balance sheets represent the aggregated balance sheets of their members. Technically, it is possible to aggregate the GHG emissions of supranationals as a sum of the emissions of their members. PCAF does not require the reporting of emissions of supranationals. However, the aggregated view can be useful for engagement with respective bodies.

EMISSION SCOPES COVERED

Financial institutions shall report sovereign borrowers' absolute scope 1 and should report scope 2 and 3 in line with the proposed scope definitions below.

Scope definition:
The GHG Protocol's definition of scope 1, 2, and 3 emissions was initially developed for the classification of corporate emissions. Next to corporate emissions, the GHG Protocol also published a Global Protocol for Community-Scale Greenhouse Gas Inventories (i.e. an Accounting and Reporting Standard for Cities)[175], which translated the scope definitions to cities. PCAF has attempted to mirror this approach for sovereign debt.

The table below represents the PCAF scope definition for sovereign debt.

[175] Global Protocol for Community-Scale Greenhouse Gas Emission Inventories, GHG Protocol, 2014 (revised edition in 2021), https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities

Table 5.9-1. PCAF scope definition for Sovereign Debt

Scope 1	Scope 2	Scope 3
Domestic GHG emissions from sources located within the country's territory *This aligns with the UNFCCC definition of domestic territorial emissions, including emissions from exported goods and services*	GHG emissions occurring as a consequence of the domestic use of grid-supplied electricity, heat, steam and/or cooling which is imported from another territory	Emissions attributable to non-energy imports as a result of activities taking place within the country territory

Under this approach, a sovereign is seen primarily as a national territory, and its direct (scope 1) GHG emissions are attributable to emissions generated within its boundaries. Similar to emissions classification of cities, scope 2 emissions are attributable to the purchase, in this case import, of electricity, steam, heat and cooling from outside the country territory. Finally, scope 3 emissions are related to all other (non-energy) imports from goods or services from outside the country's territory.

The classification allows to account for a holistic view of a sovereign's responsibility in generating emissions within and outside its boundaries. In particular, the approach allows to account for:

- Production emissions as defined by UNFCCC national emissions inventory (scope 1)
- Holistic view of a sovereign's emissions activity (scope 1 + 2 + 3) as requested by the EU Sustainable Finance Disclosure Regulation (SFDR)

Our scope 1 definition aligns with the definition of production emissions. **Production emissions** are emissions attributable to goods and services produced domestically and include domestic consumption and exports. This definition follows the territorial emissions approach adopted by UNFCCC for annual national inventories and is typically referenced by sovereigns in their Nationally Determined Contributions (NDCs).

In line with UNFCCC, the emissions should cover GHG emissions from specified key sectors and categories (energy, industrial processes and product use, agriculture, forestry, other land use, and waste).[176] However, there is a divergence of views among emissions data providers and climate experts regarding the accounting of land use, land-use change, and forestry (LULUCF) emissions given significant data uncertainty. Also, LULUCF emissions have the potential to distort the overall trends of the key sectors (energy, industrial processes) that contribute to global warming.

As countries treat LULUCF emissions differently in their mitigation targets and investors might have diverging views on the potentially offsetting role of land-use and forestry emissions, financial institutions shall report scope 1 emissions including and excluding LULUCF.

[176] Quality assurance/Quality control and verification, IPCC Guidelines for National Greenhouse Gas Inventories, 2006. https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_6_Ch6_QA_QC.pdf

Table 5.9-2. Example of Country Production Emissions including and excluding LULUCF

Country	Production Emissions incl. LULUCF ($ktCO_2e$, 2018)	Production Emissions excl. LULUCF ($ktCO_2e$, 2018)
Netherlands	191,029.65	186,394.47
Canada	736,886.99	728,475.89
Finland	48.071,9	56,281.8
Austria	73,500.8	78,627.6

Source: https://di.unfccc.int/ghg_profile_annex1

Although Production Emissions is currently frequently the key metric to account for sovereign GHG emissions, PCAF also recommends that financial institutions track the GHG emissions of countries more holistically and report Consumption Emissions as described above.

Consumption Emissions reflect the demand side of sovereign emissions and account for consumption patterns and trade effects. This metric provides a broader view of a sovereign's GHG emissions and tackles the issue of carbon leakage that arises due to production shifts from countries where goods and services are consumed later. It is also an important metric in the context of broader sovereign responsibility for emissions caused. As sovereigns focus on production emissions GHG reduction targets, their consumption emissions might follow a different trend, which can be seen in the example below:[177]

To move from production-based to consumption-based accounting, the emissions related to export should be subtracted, while emissions related to imports are added:

$$Consumption\ emissions = Production\ emissions - Exported\ emissions + Imported\ emissions$$

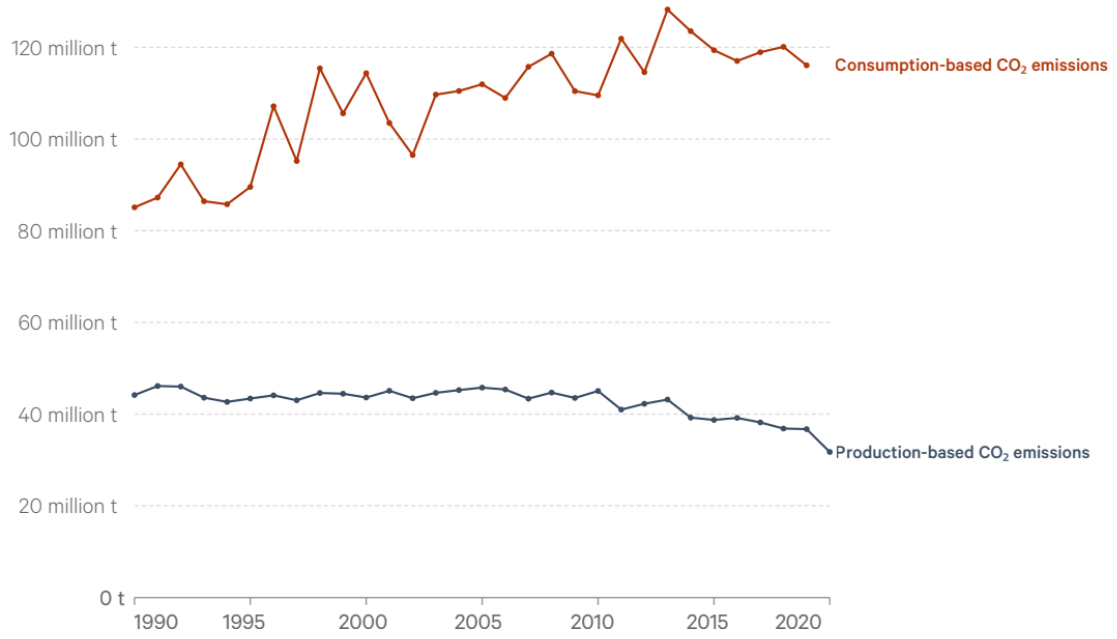
So according to our scope definition, this would be:

$$Consumption\ emissions = scope\ 1 + 2 + 3 - Exported\ emissions$$

[177] 9 Production vs. consumption-based CO_2 emissions, Switzerland, Our World in Data, 2021. https://ourworldindata.org/grapher/production-vs-consumption-co2-emissions?country=~CHE

Production vs. consumption-based CO_2 emissions, Switzerland

Annual consumption-based emissions are domestic emissions adjusted for trade. If a country imports goods the CO_2 emissions needed to produce such goods are added to its domestic emissions; if it exports goods then this is subtracted.



Source: Global Carbon Project *OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/* • CC BY
Note: This measures CO_2 emissions from fossil fuels and cement production only – land use change is not included.

Although consumption emissions are currently not included in the UNFCCC Paris Agreement Framework and inventory, financial institutions can use this metric for a more holistic assessment of a sovereign's GHG emissions and for engagement with sovereigns. They can also use this metric for potential collective engagement with the UNFCCC to broaden the scope of countries' accountability.

Nevertheless, PCAF acknowledges that there are current limitations to the usability of this metric given the following:

- Difficulty in accurate allocation of emissions along the supply value chain
- Involvement of input output models that can vary depending on the data provider
- Time lag in data availability (approximately 2 years compared with production emissions)
- The fact that only CO_2 emissions are typically available

ATTRIBUTION OF EMISSIONS

As a basic attribution principle, the financial institution accounts for a portion of the annual emissions of the financed sovereign. This portion is determined by the ratio between the outstanding exposure to sovereign debt, and the Purchase Power Parity (PPP)-adjusted GDP of the sovereign. This ratio is called the attribution factor.

PCAF requires using the following approach for attribution of emissions for sovereign debt:

$$Attribution\ factor = \frac{Exposure\ to\ Sovereign\ Bond\ (USD)}{PPP\text{-}adjusted\ GDP\ (international\ USD)}$$

1. **Exposure to Sovereign Debt (numerator)**
   This is the actual outstanding loan or bond amount that the sovereign is obligated to repay (i.e. disbursed debt minus any repayments). It will be adjusted annually to reflect the correct exposure.

2. **PPP-adjusted GDP (denominator)**
   This is a measure of a country's economic output that accounts for differences in price levels between countries. More information on the rationale for using PPP-adjusted GDP can be found in the Annex 10.3.

PCAF recognizes that the *denominator used for sovereign debt is different from the typical denominators of other asset classes,* which represent the borrowers total value (equity and debt). However, applying the same logic to countries is challenging because there is no appropriate measurement of a sovereign's equity, leaving only outstanding debt in the denominator of the attribution factor. In addition, using debt for attribution of sovereign emissions has limitations. It is inaccurate because sovereigns rarely finance themselves primarily with debt as opposed to tax revenue. Therefore, using outstanding national debt levels only (not including a measurement for equity) as the denominator for attribution makes the approach highly dependent on the extent of a country's government's debt. More information on the rationale for using PPP-adjusted GDP can be found in the Annex 10.3.

EQUATIONS TO CALCULATE FINANCED EMISSIONS

The financed emissions of sovereign debt are calculated by multiplying the attribution factor by the emissions of the respective sovereign borrower.

$$Financed\ emissions = \sum_{s} Attribution\ factor_s\ x\ Sovereign\ emissions_s$$

(with s=sovereign borrower)

Attribution factor:

$$Financed\ emissions = \sum_{s} \frac{Outstanding\ amount_s}{PPP\text{-}adjusted\ GDP_s}\ x\ Sovereign\ emissions_s$$

(with s=sovereign borrower)

Emissions intensities

In the course of the work of PCAF's sovereign debt working group, the following intensity metrics for normalization and comparison of sovereign production and consumption GHG emissions intensity, respectively, have been defined as follows:

- For sovereign production: Production Emissions / PPP-adjusted GDP

- For consumption emission intensity: Consumption Emissions / Capita

For a comparison of production emissions intensity, using a GDP metric in the denominator appears straightforward, given the link between a country's production and industrial processes causing emissions and the country's output (GDP). The PPP adjustment of GDP allows for comparing the real sizes of the economies and the output by subtracting the exchange rate effect. This effect becomes relevant for countries with a relatively stronger exchange rate effect in particular and allows for a fairer comparison of the countries, as the table below illustrates (2019 data):

Table 5.9-3. Example of difference between nominal and PPP-adjusted GDP

Country	Nominal GDP ($ Millions USD)	PPP-adj. GDP ($ Millions Int'l)
China	14,279,937	23,487,798
US	21,433,226	21,433,226
India	2,868,929	9,560,220
Japan	5,081,770	5,345,808
Germany	3,861,124	4,644,166
Indonesia	1,119,191	3,338,144
France	2,715,518	3,320,559

When comparing production emissions intensity, the PPP adjustment mitigates the negative effect for countries where production and emissions are concentrated:

Table 5.9-4. Example of difference between nominal and PPP-adjusted GDP by production emissions intensity

Country	Absolute Production Emissions Mt CO_2e	Nominal GDP ($ Millions USD)	PPP-adj. GDP ($ Millions Int'l)	(Production Emissions/ Nominal GDP)*1,000	(Production Emissions/ PPP-adj. GDP)*1,000
China	11,535	14,279,937	23,487,798	0.81	0.49
US	5,107	21,433,226	21,433,226	0.24	0.24
India	2,597	2,868,929	9,560,220	0.91	0.27
Japan	1,154	5,081,770	5,345,808	0.23	0.22
Germany	703	3,861,124	4,644,166	0.18	0.15
Indonesia	626	1,119,191	3,338,144	0.56	0.19
France	315	2,715,518	3,320,559	0.12	0.09

Emissions source: Edgar, 2019. Intensity KPIs are multiplied by 1,000 for better visualization of the comparison.

For consumption emissions, PCAF recommends using normalization per capita. Consumption emissions reflect the demand side of the economy, and normalization per capita appears natural. In line with the arguments stated above, PCAF recommends using the consumption emissions intensity as an additional metric to obtain a holistic view of a country's GHG emissions.

The table below illustrates that some countries tend to have higher consumption emissions than production emissions, but the difference is not always significant (e.g., India), implying that countries with notable contributions to production emissions can be equally high consumers.

PCAF recommends considering both the production and consumption intensity metrics when comparing, monitoring, and engaging with sovereigns.

Table 5.9-5. Example different intensity metrics Sovereign Debt

Country	Absolute Production Emissions Mt CO_2e	Absolute Consumption Emissions $MtCO_2e$	Rank by Production Emissions/ PPP-adj. GDP	Rank by Consumption Emissions per Capita
China	11,535	8,960	1	5
US	5,107	5,767	3	1
India	2,597	2,355	2	7
Japan	1,154	1,312	4	2
Germany	703	862	6	3
Indonesia	626	591	5	6
France	315	442	7	4

For all of the metrics, PCAF recommends that financial institutions review at least 5 years of historical data for a better understanding of sovereigns' overall emissions trends and underlying patterns (e.g., production versus consumption).

DATA REQUIRED

Similar to other asset classes, PCAF distinguishes for sovereign debt also three options to calculate the financed emissions:

- Option 1: reported emissions
- Option 2: physical activity-based emissions
- Option 3: economic activity-based emissions and proxy estimation

While options 1 and 2 are based on country-specific reported emissions or primary physical activity data of the country's energy consumption. Option 3 is based on sectoral revenue data and using a proxy to estimate a country's GHG emissions. Options 1 and 2 are preferred over Option 3 from a data perspective because they provide more accurate emissions. Due to data limitations, financial institutions might use Option 1 or 2 for certain countries and Option 3 for others. The data quality mix shall be reflected in the average data quality score, as chapter 6 illustrates.

Table 5.9-6 provides data quality scores for each of these options and sub-options (if applicable) that can be used to calculate the financed emissions for sovereign debt.

Table 5.9-6. General description of the data quality score table for Sovereign Debt

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

Data Quality	Options to estimate financed emissions		When to use each option
Score 1	Option 1: Reported emissions	1a	Verified GHG emissions of the country are available. These GHG emissions are reported by the country itself and can be extracted from UNFCCC[178]
Score 2		1b	Unverified emissions of the country are available.
Score 3	Option 2: Physical activity-based emissions	2	Reported GHG emissions of the country are not known. Emissions are calculated using primary physical activity data of the country's energy consumption (domestic generated and imported) and emission factors specific to that primary data.
Score 4	Option 3: Economic activity-based emissions	3a	Reported GHG emissions of the country are not known. Emissions are calculated using sectoral revenue data of the country's production and emission factors specific to that revenue data.
Score 5		3b	Country GHG emissions are estimated by taking a proxy. GHG emissions from (a) similar (climate (zones), wealth, GDP) country are taken to estimate the country GHG emissions.

A detailed summary of the data quality score table, including data needs and equations to calculate financed emissions, is provided in Annex 10.1 (Table 10.1-7). Annex 10.3 (Table 10.3-4) includes a list of public data sources PCAF has identified, which could be used for calculating financed emissions from sovereign debt.

LIMITATIONS

Emissions scope

The presented approach to classify scope 1, 2, and 3 emissions of sovereigns is an attempt to mirror the approach developed and adopted for corporates and cities and can't be compared 1:1.

Double counting

Double counting occurs in two dimensions:

1. Double counting of emissions of non-sovereign sectors (e.g. corporates) due to accounting of emissions at sovereign territorial level.

This represents a challenge for a financial institution with investment portfolios in multiple asset classes. However, doubling counting within the GHG emissions reports of financial institutions is not necessarily problematic as long as emission results of the different asset classes are clearly reported separately.

[178] This refers to UNFCCC reporting requirements. For the purposes of verification, Annex I Parties should compare their national estimates of CO_2 emissions from fuel combustion with those estimates obtained using the IPCC reference approach, as contained in the 2006 IPCC Guidelines, and report the results of this comparison in the NIR.

Accounting for all emissions indirectly involved with loans and investments of the different individual asset classes does ensure that the right considerations are taken when making lending or investment decisions.

1. Double counting of emissions of other sovereigns when accounting for emissions beyond scope.

The issue is not different from the one with corporate emissions and should be resolved/treated consistently, i.e. double-counting accepted when accounting for emissions beyond scope 1.

Attribution Factor

PCAF acknowledges that PPP-adjusted GDP has its limitations as the attribution factor: it is a flow metric, and the relationship between investments and GDP are not 1:1. There are, however, reasons as stated above that justify the usability of this attribution factor. More information on the rationale for using PPP-adjusted GDP can be found in the Annex 10.3.

Alternative attribution factors might still emerge, and PCAF is ready to review these. For example, Total capital stock (IMF)[179] - a measure of total value of gross fixed capital formation in the economy - has also been briefly reviewed. The concept is comparable to total capital and EVIC for corporates. Though a reasonable theoretical concept, the metric has multiple limitations. Most importantly, this is not a readily available and reported metric, but the once calculated based on IMF Methodology, which involves assumptions, exclusion of certain sources of investments, and data availability limitations. PCAF does not recommend this metric at the current stage.

[179] Estimating Public, Private, and PPP Capital Stocks, Annex to IMF Board Paper "Making Public Investment More Efficient"

Sub-sovereign debt

PCAF®
Partnership for Carbon Accounting Financials

5.10 Sub-sovereign debt

INTRODUCTION

The purpose of this method is to provide guidance to financial institutions on how to calculate financed emissions from sub-sovereign debt. Financed emissions may be calculated on a territorial or organizational (entity) basis depending on the type of issuer as shown in Table 5.10-2 below.

The methodology described in this chapter covers the territorial approach only and leverages the PCAF Sovereign Debt methodology in subchapter 5.9. It is therefore recommended to read this chapter in conjunction with the aforementioned methodology.

For sub-sovereign issuers for which the organizational (entity) approach is more appropriate, the methodology for Business Loans and Unlisted Equity in Part A has to be used.[180] Users of this approach are recommended to move to that asset class after reading the next two sections.

ASSET CLASS DEFINITION

This asset class includes sub-sovereign bonds and sub-sovereign loans of all maturities issued by regional, city, or local governments in domestic or foreign currency. Sub-sovereign issuers are defined as issuers with jurisdiction and influence over a specific territory within a country below sovereign level e.g., regions, cities, municipalities. Organizational structures and nomenclature of administrative levels may differ by country. For example, some countries have three administrative sub-sovereign levels while others might have more or less levels. More so, “states” in the US or Australia correspond to “provinces” in Canada or Spain. To ensure consistent language and clarity, three sub-sovereign levels have been defined: regional, city and local level. Financial institutions may adapt these levels to reflect the administrative structure of the countries in which they invest.

Table 5.10-1. Territory classification example

Territory classification example for France)	
Sovereign: Country	France
Sub-Sovereign: Regional Level	Ile-de-France
Sub-Sovereign: City Level	City of Paris
Sub-Sovereign: Local Level	Paris, Essonne and other municipalities

Both sub-sovereign loans and bonds lead to the transfer of funds to the respective sub-sovereign issuer, creating a debt obligation to be repaid by the borrowing entity. Sub-sovereign debt is typically issued by regional or local governments as well as cities. This methodology covers territorial-based approaches for sovereign-like sub-sovereign issuers, and references organization-based approaches for corporate-like

[180] Note: Depending on the type of finance provided to “corporate-like” sub-sovereign issuers, either the method for ‘Business Loans and Unlisted Equity’ (lending) or ‘Listed Equity & Corporate Bonds’ (sub-sovereign bonds) is most appropriate. However, since both methodologies are identical for unlisted organizations (sub-sovereigns are considered unlisted) we refer to ‘‘Business Loans and Unlisted Equity’ only for simplicity reasons.

sub-sovereign issuers, as appropriate

Data availability on the sub-sovereign level was very limited in the past. While improvements have been made for certain countries and emission scopes, data availability is still limited, in terms of country coverage and emission scopes. However, to signal that greenhouse gas (GHG) accounting for sub-sovereign debt is important to financial institutions and to support greater emission reporting, the Sovereign Debt methodology has been extended to Sub-Sovereign Debt with certain adjustments and limitations.

"SOVEREIGN-LIKE" VERSUS "CORPORATE-LIKE" SUB-SOVEREIGN ISSUERS

This asset class includes a wide array of issuers and treating all sub-sovereigns alike may not accurately represent their financed emissions. The table below provides an overview of the different types of sub-sovereigns and the corresponding accounting approach:

Table 5.10-2. Types of sub-sovereign issuers

Sub-sovereign Type	Description and key differentiators	Examples	Accounting approach / asset class method used	Considerations to select this type
Sovereign-like sub-sovereign *without* a balance sheet	Sub-sovereign for which the territorial emissions of the region can be attributed to the regional economic output (PPP-adjusted GDP)	State of New York, Province of Quebec	Territory-based / Sovereign Debt	These sub-sovereign issuers possess a significant degree of jurisdiction and influence over a specific territory and, therefore, may exercise control over related emissions. No balance sheet is available, and no "enterprise value" or similar measure can be constructed. Financed emissions are derived from the economic activity within the region and the Purchasing Power Parity (PPP)-adjusted GDP attribution factor. For investments in and loans to such "sovereign like" sub-sovereign issuers, FIs shall use the territory-based approach described in this chapter.
Sovereign-like sub-sovereign *with* a balance sheet	Sub-sovereign for which the emissions of the economic activities of the organization can be attributed to the entities assets and liabilities (balance sheet associated emissions)	Swedish "Kommuner", Dutch "gementeen" (municipalities)	Territory based / Sovereign Debt Or Organization-based / Business Loans & Unlisted Equity	Some sub-sovereign issuers possess a significant degree of jurisdiction and/or influence over a specific territory and are responsible for the provision of specific and/or general public services and facilities (e.g. waste management, water control). Due to their constitutional regime, a balance sheet statement or similar measure of enterprise value is available or may be constructed. Activity-based GHG emissions data for the sub-sovereign covered in that balance sheet statement is also available. This emissions data typically covers emissions from own activities like waste management, public-service buildings, and general infrastructure.

				Hence, the emission scope differs from the territorial approach described in this part of the standard. For these regional circumstances FIs **shall** use either the territory-based approach described in this chapter, **or** the organization-based approach, similar to corporate-like sub-sovereigns as described below. In case the territory-based approach is applied, territorial emissions are attributed to PPP-adjusted GDP.
Corporate -like	Sub-sovereign which in its operations and mandate is comparable to a corporate	Indiana Municipal Power Agency, SNCF Reseau	Organization – based / Business Loans & Unlisted Equity	These issuers are generally responsible for specific public services and facilities such as energy generation or waste services and tend to be structured as either state-owned companies or government agencies. Financed emissions are derived from the economic activity of the funded entity and attributed based on enterprise value. For loans and investments in "corporate-like" sub-sovereign issuers, FIs shall use the'Business Loans & Unlisted Equity methodology.

Financial institutions shall make it clear in their methodologies and disclosures, adapted to regional circumstances, whether they use a territory-based or an organization-based approach on emissions from sovereign-like sub-sovereign counterparties.

Therefore, the type of sub-sovereign issuer (sovereign- or corporate-like) and the availability of balance-sheet information will determine if emissions will be accounted for using the territory-based accounting methodology outlined in this chapter.

Whether a sub-sovereign exhibits corporate-like characteristics or not is best judged by the financial institution. PCAF acknowledges that classifying a sub-sovereign issuer as sovereign- or corporate-like might not always be unambiguous and some deviations among financial institution might occur.[181]

Use of proceeds bonds that finance specific projects—where other methods outlined in Part A are more suitable—are excluded.

PCAF acknowledges that in certain cases, regional or local governments might have limited control over high-emitting industries or companies located within their regional boundaries. However, this does not mean that sovereign-like sub-sovereigns should be excluded from financed emissions. Rather, this information can be used to engage sovereigns or identify levers that can be pulled by regional governments to reduce GHG emissions within the territory through initiatives like reforestation, funding research on lower carbon solutions, etc.

[181] One information which could be helpful to distinguish between sovereign- and corporate-like sub-sovereigns is the Bloomberg field "BB_INDUSTRY_SUBGROUP".

EMISSIONS COVERED

When accounting for financed emissions from sub-sovereign debt, financial institutions **shall** report sub-sovereign borrowers' absolute scope 1 emissions and **should** report scope 2 and 3 emissions, in line with the proposed scope definition below. For certain sub-sovereign debt, this approach permits estimates with lower data quality scores (see Table 5.10-5).

Scope definition

The table below represents the sub-sovereign debt emission scope definitions, in line with the definition for the Sovereign Debt asset class:

Table 5.10-3. Emissions scope definitions

Scope 1	Scope 2	Scope 3
Domestic GHG emissions from sources located within the regional territory where there is jurisdiction.	*GHG emissions occurring because of the domestic use of grid-supplied electricity, heat, steam and/or cooling which is imported from another regional territory where there is no jurisdiction or direct influence*	Emissions attributable to non-energy imports because of activities taking place *within the regional territory where there is* jurisdiction and direct influence

The GHG Protocol's definition of scope 1 emissions was initially developed for the classification of corporate emissions. Alongside corporate emissions, the GHG Protocol published a Global Protocol for Community Scale Greenhouse Gas Inventories (i.e. an Accounting and Reporting Standard for Cities),[182] which translated the scope definitions to cities. PCAF currently mirrors this approach for the Sovereign Debt asset class. The Sub-Sovereign debt method aims to do the same by applying the same logic for emissions accounting across sub-sovereign levels. PCAF defines scope 1 emissions of sub-sovereigns as the domestic GHG emissions from sources located within the regional, city or local territory where there is jurisdiction and direct influence.

The scope 1 definition aligns with the definition of production emissions. Production emissions are emissions attributable to emissions produced domestically and include domestic consumption and exports. Scope 1 emissions should cover GHG emissions from key sectors and categories such as energy, industrial processes and product use, agriculture, forestry, other land use, and waste. However, there is a divergence of views among emissions data providers and climate experts regarding the accounting of land use, land-use change, and forestry (LULUCF) emissions, given significant data uncertainty. Compared to sovereigns, LULUCF data reporting for sub-sovereigns has greater limitations. Nevertheless, some sub-sovereign regions (e.g. California) report scope 1 emissions including LULUCF.

[182] Global Protocol for Community-Scale Greenhouse Gas Emission Inventories, GHG Protocol, 2014 (revised edition in 2021), https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities

Table 5.10-4. Example of sub-sovereign emissions by inventory sector

California Emissions by Inventory Sector, MMT CO2 eq.	2022
Energy	321.740
Agriculture	33.370
Industrial processes and product use	19.318
Waste	15.297
Gross total	**389.726**
LULUCF	-32.724
Net total	**357.002**

Source: United States Environmental Protection Agency (EPA), GHG Inventory Data Explorer

Hence, financial institutions **shall** report scope 1 emissions, excluding LULUCF, and **should** report scope 1 emissions including LULUCF, where data is available. Financial institutions **shall** be transparent about the underlying scope of emissions reported.

ATTRIBUTION OF EMISSIONS

The attribution of emissions determines the share of sub-sovereign emissions that a financial institution accounts for, based on its exposure to sub-sovereign debt. The attribution factor is calculated as the ratio of the financial institution's outstanding exposure to the sub-sovereign borrower, divided by the sub-sovereign's PPP-adjusted GDP.

PCAF requires the following approach for attribution of emissions for sub-sovereign debt:

$$Attributed\ emissions = \frac{Exposure\ to\ Sub\text{-}sovereign\ Bond\ (USD)}{Sub\text{-}sovereign\ PPP\text{-}adjusted\ GDP\ (international\ USD)} * Sub\text{-}sovereign\ emissions\ (tCO2e)$$

(where s = sub-sovereign borrower)

1. Exposure to Sub-Sovereign Debt (Numerator)

The numerator is the actual outstanding loan or bond amount that the sub-sovereign is obligated to repay (i.e., disbursed debt minus any repayments). This value should be updated annually to reflect the current exposure.

2. PPP-adjusted GDP (denominator)

The denominator is the sub-sovereign's GDP, adjusted for purchasing power parity (PPP). As PPP-adjusted GDP is not typically available at the sub-sovereign level, the country's PPP adjustment factor should be applied to the sub-sovereign's nominal GDP. More guidance on how to calculate PPP-adjusted GDP for sub-sovereigns can be found in Annex 10.3.

To prevent the attribution factor from exceeding one, financial institutions **shall** cap the outstanding debt to PPP-adjusted GDP ratio at 1.

PCAF recognizes that the denominator used for sub-sovereign debt is different from the typical denominators of other asset classes, which represent the borrowers' total value (equity and debt). However, applying the same logic to local governments is challenging because there is no appropriate measurement of a sub-sovereign's equity, leaving only outstanding debt in the denominator of the attribution factor. In addition, using debt for attribution of sub-sovereign emissions has limitations. It is inaccurate because sub-sovereigns rarely finance themselves primarily with debt as opposed to tax revenue. Therefore, using outstanding local debt levels only (not including a measurement for equity) as the denominator for attribution makes the approach highly dependent on the extent of a local government's debt. More information on the rationale for using PPP-adjusted GDP can be found in the Annex 10.3.

EQUATIONS TO CALCULATE FINANCED EMISSIONS AND EMISSION INTENSITIES

The financed emissions of sub-sovereign debt are calculated by multiplying the attribution factor by the emissions of the respective sub-sovereign borrower.

$$Attribution\ factor_s = \frac{Outstanding\ amount_s}{PPP\text{-}Adjusted\ GDP_s}$$

$$Financed\ emissions = \sum_s Attribution\ factor_s \times Sub\text{-}sovereign\ emissions_s$$

$$Financed\ emissions = \sum_s \frac{Outstanding\ amount_s}{PPP\text{-}adjusted\ GDP_s} \times Sub\text{-}sovereign\ emissions_s$$

(with s = Sub-sovereign borrower)

Emissions intensities

In line with the sovereign debt method, the following optional intensity metric for normalization and comparison of sub-sovereign production GHG emissions intensity has been defined:

$$For\ sub\text{-}sovereign\ production = {}^{Production\ Emissions}/_{PPP\text{-}adjusted\ GDP}$$

Scope 2 and scope 3 as well as exported emissions are not as widely available for sub-sovereigns and are therefore not included in this intensity method. Hence, consumption emissions cannot be calculated due limited data availability. Improvements in data availability may trigger an update to this method.

DATA REQUIRED

PCAF distinguishes three options to calculate the financed emissions associated with sub-sovereign debt:

- Option 1: reported emissions. Verified or unverified GHG emissions data reported by the sub-sovereign territory (regional, city, or local level). This is the preferred option where available.

- Option 2: physical activity-based emissions. If reported emissions are not available, emissions may be calculated using primary physical activity data (e.g., energy consumption within the sub-sovereign territory) and relevant emission factors.
- Option 3: economic activity-based emissions and proxy estimation. Where neither reported nor physical activity data are available, emissions may be estimated using sectoral revenue data or by applying proxies (e.g., emissions from higher administrative levels).

The table below provides data quality scores for each of these options (if applicable) for scope 1 emissions of sub-sovereign issuers.

Table 5.10-5. General description of the data quality score table for sub-sovereign debt
(score 1 = highest data quality; score 5 = lowest data quality)

Data Quality	Options to estimate the financed emissions		When to use which approach
Score 1	Option 1: Reported Emissions	1a	Verified reported sub-sovereign territory data are available.
Score 2		1b	Unverified reported sub-sovereign territory data are available.
Score 3	Option 2: Physical activity-based emissions	2	Reported GHG emissions of sub-sovereign territory of the issuer are not known. Emissions are calculated using primary physical activity data of the energy consumption within the sub-sovereign territory and emission factors specific to that primary data.
Score 4	Option 3: Economic activity-based emissions	3	Reported GHG emissions of sub-sovereign territory of the issuer are not known. Emissions are calculated using sectoral revenue data of the sub-sovereign territory production and emission factors specific to that revenue data.
Score 5	Option 4: Use data from higher administrative levels without break-down	4a	Sub-sovereign territory GHG emissions are estimated by taking a proxy. GHG emissions from one level above (e.g. regional data as proxy for city data) is used
		4b	Sub-sovereign territory GHG emissions are estimated by taking a proxy. GHG emissions from two levels above (e.g. country-level data for city data) are used

A detailed summary of the data quality score table, including data needs and equations to calculate financed emissions, is provided in Annex 10.1 (Table 10.1-8).

PCAF has decided to include sovereign-like sub-sovereigns as several large countries have started to report scope 1 emissions on a regional level e.g., “States” in the US, NUTS2 level in the EU. For potential data sources, please see Annex 10.3. Data on local administrative levels is less comprehensive and consistent, whilst reporting at city level has increased. As elaborated in the data quality table, this method

allows for using proxies for sub-sovereign scope 1 emissions. However, using actual reported emissions data is the preferred option for issuers at all administrative levels.

For these sovereign-like entities, FIs **should** disclose financed emissions from regional, city and local levels separately. Summing regional, city and local level emissions runs the risk of double counting territorial emissions. Although this approach is still accepted, FIs **should** transparently explain their approach. The breakdown of corporate-like sub-sovereigns Business Loans and Unlisted Equity asset class is recommended to be merged using NACE or ISIC classification as appropriate. Disaggregating regional, city and local levels while disclosing financed emissions for corporate-like sub-sovereigns is not a specific

LIMITATIONS

Data availability

Emissions

Data availability for scope 1 emissions has improved in the recent past. However, this is mainly the case for developed economies and within the first or second administrative level below the sovereign level. This is not yet the case at local levels. There is little data available for several emerging market countries currently. In cases where scope 1 emissions are available, it is recommended to implement data quality review practices. Scope 2, scope 3 and exported emissions are currently mostly unavailable at sub-sovereign levels.

PPP-adjusted GDP

PPP-adjusted GDP is not available at sub-sovereign levels. Applying the respective country PPP-adjustment factor to convert sub-sovereign GDP to PPP-adjusted GDP has some limitations, not reflecting that price levels deviate across regions within one country. However, it seems reasonable for regions with the same currency.

EMISSIONS SCOPE

The presented approach to classify scope 1 emissions of sub-sovereigns is an attempt to mirror the approach developed and adopted for corporates and cities. However, these approaches cannot be compared one-to-one.

DOUBLE COUNTING

Double counting occurs in two dimensions:

1. Double counting of territorial emissions at sovereign, sub-sovereign regional level (e.g. states) and sub-sovereign local levels (e.g. cities, municipalities)

This represents a challenge for a FI with investment and lending portfolios in multiple asset classes at the territorial level. However, double, and even triple counting within the GHG emissions reports of FIs is not necessarily problematic as long as different asset classes' emissions are clearly reported separately. Accounting for all emissions indirectly involved with loans and investments of the different individual asset

classes ensures that the right considerations are taken when making lending or investment decisions. FIs **shall** disclose financed emissions from sovereign and sub-sovereign levels separately. Financial institutions **should** disclose financed emissions from regional and local levels separately.

2. Double counting of emissions of non-sovereign sectors (e.g. corporates) due to accounting of emissions at the sub-sovereign territorial level.

ATTRIBUTION FACTOR (EQUIVALENT TO SOVEREIGN DEBT)

PCAF acknowledges that PPP-adjusted GDP has its limitations as the attribution factor: it is a flow metric, and the relationship between investments and GDP is not one-to-one. There are, however, previously stated reasons that justify the usability of this attribution factor. For more explanation on this, see Annex 10.3.

Reporting requirements and recommendations

PCAF®
Partnership for Carbon Accounting Financials

6. Reporting requirements and recommendations

6.1 Overall reporting requirements and recommendations

To manage financial and reputational risk it is crucial that the financial sector reports GHG emissions of loans and investments for transparency and accountability. The following reporting requirements and recommendations guide financial institutions to disclose the GHG emissions associated with their loans and investments. Rather than creating a new framework, PCAF developed these reporting requirements and recommendations to complement existing frameworks such as TCFD, GRI, Sustainability Accounting Standards Board (SASB), generally accepted accounting principles (GAAP), and International Financial Reporting Standards (IFRS). It adheres to and builds upon the reporting requirements set out by the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

All financial institutions that commit to using this Financed Emissions Standard shall fulfil certain requirements when disclosing their financed emissions publicly. However, they do have the flexibility to decide where they want to start with measuring and disclosing their financed emissions—for instance, at a specific asset class level or for a specific sector within a certain asset class. Flexibility in reporting is allowed largely because of recognized limitations in data availability and quality. PCAF recognizes that data for many asset classes may not be available to financial institutions and that a financial institution may not be able to disclose 100% of its portfolio. However, financial institutions shall be transparent in their coverage and justify any exclusions.

The requirements for disclosure of financed emissions describe a minimum disclosure level with room for financial institutions to report beyond this level. Any requirements not fulfilled must be accompanied by an explanation. Minimum reporting requirements are described in this chapter using the word “shall.” Where certain aspects of reporting are not required but encouraged as best practice, the word “should” is used.

REPORT USING THE OPERATIONAL OR FINANCIAL CONTROL CONSOLIDATION APPROACH[183]

The asset class methods in this Financed Emissions Standard are used to calculate the scope 3 category 15 emissions from financial investments. According to the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard,[184] three consolidation approaches can be applied by financial institutions to account for their scope 1, 2, and 3 emissions—namely equity share, operational control, and financial control. For PCAF reporting, financial institutions **shall** use the operational control approach or the financial control approach; as a result, all financed emissions **shall** be accounted for in their scope 3 category 15 reporting.

[183] Additional information on consolidation approaches can be found in Chapter 4
[184] (WRI and WBCSD, 2011)

OVERALL REPORTING REQUIREMENTS AND RECOMMENDATIONS

- **Principles**: GHG accounting and reporting of financial institutions **shall** be based on the following principles: relevance, completeness, consistency, transparency, and accuracy.
- **Purpose:** A financial institution's reporting **should** align with its specific business goals; for instance, for identifying and managing climate-related transition risks or for steering toward a specific emissions reduction target.
- **Frequency:** Financial institutions **shall** disclose at least annually and at a fixed point in time in line with the financial accounting cycle. Financial institutions **shall** ensure that the chosen point in time provides a representative view on the emissions for that reporting year and **shall** transparently disclose if large changes close to (before/after) the reporting date affected the results.
- **Recalculation and significance threshold**: Financial institutions **shall**, in line with the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard requirement[185], establish a baseline recalculation policy to define under which circumstances a recalculating of (base year) financed emissions is necessary to ensure the consistency, comparability, and relevance of the reported GHG emissions data over time. As part of this base year emissions recalculation policy, financial institutions **shall** establish and disclose the significance threshold[186] that triggers base year emissions recalculations.
- **Form of reporting**: Financial institutions **shall** disclose in publicly available reports such annual reports, website articles, or other publicly available sources as deemed appropriate by the financial institution. Annex 10.2 provides an example template for how financial institutions can disclose their financed emissions.
- **Past performance**: Where appropriate and relevant for their business goals, financial institutions **should** disclose their financed emissions for multiple comparable time periods, e.g., years.

COVERAGE

- Financial institutions **shall** disclose all absolute emissions for all relevant asset classes or sectors[187] covered in chapter 5 and justify any exclusions. Potential justification criteria for exclusion include:
  - Data availability: Required data is not available to the financial institutions.
  - Size: The activities are insignificant to the institution's total anticipated financed emissions.
  - Methodology: There is no global methodology to quantify the financed emissions of specific activities (i.e., asset classes not covered in this Financed Emissions Standard).
- Financial institutions **shall** disclose the percentage of their total loans and investments covered in their financed emissions inventories for the seven asset classes covered in chapter 5, e.g., a financial institution's total outstanding loans and investments by asset class, noting any limitations and exclusions.
- Financial institutions **may** disclose emissions from undrawn loans, in accordance with PCAF's optional IFRS reporting of undrawn loans methodology (see subsection 6.2 Optional IFRS reporting of

[185] (WRI and WBCSD, 2011)
[186] Definition according to the GHG Protocol: "A significance threshold is a qualitative and/or quantitative criterion used to define any significant change to the data, inventory boundaries, methods, or any other relevant factors."
[187] Financial institutions can choose to report by sector rather than asset class.

undrawn loans). If disclosed, emissions from undrawn loans **shall** be reported separately from financed emissions and emission removals.

GASES AND UNITS

- Financial institutions **shall** account for the seven gases under the Kyoto Protocol that are also mandated under the UNFCCC to be included in national inventories if they are emitted in the value chain. These are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).
- These seven gases **shall** be converted to carbon dioxide equivalents (CO_2e) using the 100-year time horizon global warming potentials published by the IPCC—**either** the AR5 values published by the GHG Protocol[188] or the IPCC's most recently published assessment report.[189]
- Financial institutions **shall** express their financed emissions in metric tonnes of carbon dioxide equivalents (tCO_2e) or another appropriate metric conversion—e.g., kilotonnes ($ktCO_2e$), megatonnes ($MtCO_2e$). When emissions from a specific GHG (e.g., methane emissions) are material and relevant, financial institutions **should** consider a separate disclosure of these emissions.
- Biogenic CO_2 emissions that occur in the value chain **shall** not be included in the scopes but shall be included and separately reported in the public report.

ABSOLUTE EMISSIONS

- Financial institutions **shall** disclose the absolute emissions (scope 1 and 2 combined) of their loans and investments. If it serves the business goals of the financial institutions, absolute scope 1 and scope 2 emissions of loans and investments should be reported separately from each other.
- Beyond the reporting of scope 3 category 15 emissions covered by this Financed Emissions Standard, financial institutions **shall** also measure and report their scope 1 and 2 emissions and any other relevant scope 3 emissions categories in line with the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard (see Annex 10.2 for an example).
- Where required by the relevant methodology in Chapter 5, financial institutions **shall** separately disclose the absolute scope 3 emissions of their loans and investments, including the specific sectors covered.
- Financial institutions **shall** disaggregate and disclose absolute emissions data at the asset class or at the sector level, particularly for the most emission-intensive sectors (e.g., energy, power, cement, steel, automotive).
- In addition to this minimum disaggregation requirement, financial institutions **may** choose to disaggregate absolute emissions data by other portfolio characteristics when relevant to their business goals (see further Box 6.1-1).
- When a financial institution *issues* an integrated use of proceeds structure, the institution **shall** separately report the emissions (in line with applicable PCAF reporting requirements) and total debt covered by the structure to inform investors in the structure.

[188] (GHG Protocol, 2014)
[189] The IPCC reports can be found at: https://www.ipcc.chl

- When a financial institution is an initial sponsor or lender of a specific project, the institution **should** also assess and report the absolute lifetime scope 1 and 2 emissions of the project that was financed during the reporting year.
- Absolute emissions **shall** be reported without taking into account carbon credits retired by clients to offset these emissions. Carbon credits retired by clients may be reported, and if so, shall be reported separately.

Box 6.1-1. Optional further disaggregating and disclosing absolute emissions data in specific investments

In addition to the minimum disaggregation requirements of PCAF (by asset class or industry), financial institutions may choose to disaggregate absolute emissions data by portfolio characteristics—such as green finance, transition finance, managed phase-out, or regulatory alignment (e.g., EU Taxonomy)—to enhance transparency and clarify emissions drivers. This can be particularly relevant for financing in hard-to-abate sectors or those supporting real-economy decarbonization.

Examples include green bonds, sustainability-linked instruments, and conventional bonds from issuers aligned or aligning to net zero. When doing so financial institutions should clearly disclose the criteria used for categorization, as PCAF does not prescribe specific classification systems.

To avoid double counting where categories overlap (such as a sustainability-linked loan issued by a counterparty whose activities also meet transition finance criteria), financial institutions should explain how exposures are assigned—whether through a hierarchy, split attribution, or other method. Material year-on-year changes in disaggregated data, for example when such changes result from the recategorization of exposures (e.g., counterparties gaining or losing alignment with a classification system) should also be disclosed.

Box 6.1-2. Double counting in reporting absolute emissions

Double counting—which occurs when GHG emissions are counted more than once in the financed emissions calculation of one or more institutions—should be avoided as much possible. Double counting occurs between the different scopes of emissions from loans and investments when a financial institution invests in stakeholders that are in the same value chain. This form of double counting cannot be avoided, but it can be made more transparent by reporting the scope 1 and 2 emissions of loans and investments separately from their scope 3 emissions. Apart from this, double counting can take place at five levels:

- Between financial institutions
- In co-financing the same entity or activity
- Between transactions within the same financial institutions
- Across different asset classes
- Within the same asset class

PCAF recognizes that double counting of GHG emissions cannot be avoided completely; however, it should be minimized. Double counting between co-financing institutions and between transactions within the same asset class of a financial institution are avoided by using the appropriate attribution rules defined by PCAF consistently.

By using the correct attribution method, double counting of emissions between institutions can be minimized. Financial institutions using the methodologies in the Financed Emissions Standard will be subject to the same exposure to double counting so that one financial institution will not be more significantly burdened than another.

FLUCTUATION ANALYSIS[190]

Financed emissions are sensitive to several variables, and year-on-year changes in these variables can in turn cause large fluctuations in the financed emissions metric over time, which may not reflect changes in activity, or the decarbonization actions of financial institutions or their clients. Disclosing the key drivers behind changes in financed emissions is considered the best practice for helping stakeholders understand the real-world emissions impact.

A fluctuation analysis helps to explain the drivers of changes in financed emissions between consecutive reporting periods and significantly improves transparency.

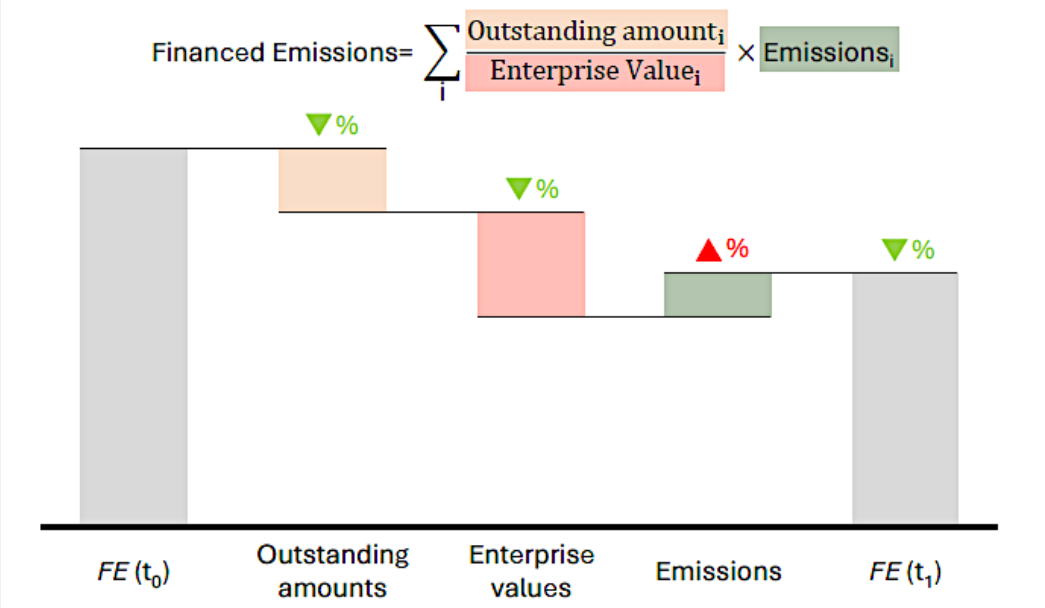
- In case year on year absolute financed emissions have significantly[191] changed due to causes unrelated to portfolio or emissions changes of the underlying assets, financial institutions **should** disclose drivers of changing financed emissions profiles through descriptive narrative or other means.
- Financial institutions **should** provide a 'fluctuation analysis' of the absolute financed emissions across their portfolio, explaining the drivers of changes to financed emissions between two reporting periods. An example is provided in Box 6.1-3.
- Financial institutions **may** provide fluctuation analyses at the asset class or sector level, in accordance with the disaggregation of disclosed absolute emissions.
- Financial institutions **may** identify the most appropriate approach for the fluctuation analyses. Where financial institutions disclose a fluctuation analysis, they **shall** disclose the calculation basis including the assumptions and limitations.

Box 6.1-3. An illustrative example for developing fluctuation analysis for a business loan portfolio

There are multiple approaches to perform a fluctuation analysis for financial institutions portfolios. An illustrative approach to providing such an analysis was laid out in the paper on 'Understanding the Drivers of Investment Portfolio Decarbonisation' published by the UN-convened Net-Zero Asset Owner Alliance (NZAOA)[192]. Data providers have also drafted bespoke approaches to perform such attribution analyses.

[190] While other bodies (e.g. NZAOA) refer to this form of analysis as an 'attribution analysis', PCAF has decided to use the term 'fluctuation analysis' to avoid confusion with existing PCAF terms.
[191] Financial institutions are encouraged to apply the significance threshold established in the 'Overall Reporting Requirements and Recommendations' section when determining whether to disclose a fluctuation analysis.
[192] Understanding the Drivers of Investment Portfolio Decarbonisation, United Nations Environment Program – Finance Initiative

An illustrative example has been laid out *below* that can be employed as initial guidance. As disclosures mature, suitable best practices and industry standards can be developed to ensure consistency of approach.



In the illustrative example above, the absolute changes in total financed emissions between baseline year t_0 and the subsequent year t_1 are broken down into the primary components of the PCAF methodology, of outstanding amounts, enterprise values, and emissions. The analysis may be broken down into further components (e.g. outstanding amounts can be broken down into new lending/investments, lending maturity/divestments and changes to existing lending/investments). The analyses should be completed with a narrative explaining the background of the observed fluctuations.

AVOIDED EMISSIONS AND EMISSION REMOVALS[193]

- In addition to absolute emissions, financial institutions:
  - **Should** report emission removals where relevant to their loans and investments when appropriate methodologies become available.
  - **May** report avoided emissions following PCAF's supplemental guidance on financed avoided emissions and forward-looking metrics.
- If financial institutions choose to disclose emission removals or avoided emissions, they **shall** disclose absolute emission removals or avoided emissions separately from the financial institution's scope 1, scope 2, and scope 3 inventories (see Annex 10.2 for an example).
- Avoided emissions and emission removals **shall** be reported without taking into account carbon credits generated for these same emissions. Carbon credits generated by clients **should** be reported, and if so, shall be reported separately.

[193] As defined in Chapter 3, removed emissions are those related to projects or technologies that can result in CO_2 being sequestered by trees or removed from the atmosphere and stored in solid or liquid form.

EMISSION INTENSITY

- Financial institutions **should** report economic emission intensities if these values are relevant to their business goals.
- Economic emission intensities **shall** be expressed on a portfolio, asset class, or sector level in metric tonnes of carbon dioxide equivalents per million euro or dollar invested or loaned: tCO_2e/€M or tCO_2e/$M
- When relevant to their business goals, financial institutions **should** consider reporting physical emission intensities per sector using sector-specific activity (e.g., tCO_2e/m^2 for real estate, tCO_2e/MWh for power utilities, tCO_2e/tonne of steel produced for steel companies, etc.).

Box 6.1-4. Financed emission metrics and comparability

Measuring financed emissions in absolute terms provides financial institutions with a consistent baseline for analysis and disclosure. When banks and investors aim to benchmark or compare companies, sectors, or portfolios to each other, normalization is required. Absolute financed emissions at a portfolio level are not a good metric to compare or benchmark financial institutions on their performance due to the potential differences between financial institutions in terms of size, product portfolio, exposure to sectors and regions, etc. For comparability and benchmarking, the absolute financed emissions need to be translated into an emission intensity metric (emissions per a specific unit).[194]

A wide array of intensity metrics is applied in the market and each has its own merits. The table below includes a list of the most common metrics.

Metric	Purpose	Description
Absolute emissions	To measure the emissions associated with financial activities and establish a baseline for disclosure and performance tracking	The total GHG emissions of an asset class or portfolio
Economic emission intensity	To understand how the emission intensities of different portfolios (or parts of portfolios) compare to each other per monetary unit	Absolute emissions divided by the loan or investment volume in EUR or USD, expressed as tCO_2e/€M or tCO_2e/$M loaned or invested
Physical emission intensity	To understand the efficiency of a portfolio (or parts of a portfolio) in terms of total GHG emissions per unit of a common output	Absolute emissions divided by a value of physical activity or output, expressed as, e.g., tCO_2e/MWh, tCO_2e/tonne product produced
Weighted average carbon intensity (WACI)[195]	To understand exposure to emission-intensive companies	Portfolio's exposure to emission-intensive companies, expressed as tCO_2e/€M or $M company[196] revenue

[194] Actual performance benchmarking or target setting for financial institutions is not covered by this Standard. For this type of assessment, other initiatives exist that build on the accounting requirements set forth in this Standard but that further rely on their own methodologies and approaches. Examples include the SBTi or RMI's Center for Climate-Aligned Finance.
[195] (TCFD, 2017)
[196] The word company refers to the financial institution's borrower or investee.

DATA AND DATA QUALITY

- Financial institutions **shall** use the most recent or otherwise appropriate data available to them. PCAF recognizes there is often a lag between financial reporting and required emissions data, such as emission factors or emissions data from borrowers or investees. In these instances, it is acceptable that the data represents different years.
- To account for inflation, a financial institution **may** apply an inflation adjustment to economic emission factors. For example, an adjustment can be made specific to the asset's geographic location or based on the currency of the emission factor. If an inflation adjustment is applied, the methodology used **shall** be disclosed. Examples of indices can be found in Box 6.1-5.
- Financial institutions **should** provide a description of the types and sources of data— including activity data, assumptions, emission factors, and all relevant publication dates— used to calculate emissions.
- Descriptions **should** be written to create transparency.
- Financial institutions **should** publish a weighted score by outstanding amount of the data quality of reported emissions data or **should** explain why they are unable to do so. An example is provided in Box 6.1-6.
- Where financial institutions are reporting scope 3 emissions, the weighted data quality score of these emissions **shall** be reported separately from that of scopes 1 and 2.
- The data hierarchy tables provided in each asset class method in Chapter 5 **should** be used as a guide for disclosing data quality. Financial institutions **should** explain how data quality is assessed, acknowledging that it will improve over time.
- Over time and where possible, data **should** be verified to at least a level of limited assurance. Financial institutions **should** disclose whether data is verified and to what level.

Box 6.1-5. Inflation indices examples

PCAF recommends the application of an inflation factor to economic emission factors. Several inflation indices may be utilized for this purpose, including the Consumer Price Index (CPI), Producer Price Index (PPI), and the Gross Domestic Product (GDP) Deflator. Among these, the GDP Deflator and CPI offer the broadest global coverage, with the GDP Deflator encompassing government expenditures—which typically exert minimal influence on a financial institution's equity and bond holdings. In alignment with this guidance, the proposed adjustment pertains specifically to the data quality score 4 and data quality score 5 emission factors, which are employed to estimate emissions in the absence of reported data.

Box 6.1-6. An illustrative example for calculating weighted data quality scores

Data quality will likely differ across asset classes, sectors, companies, and emission scopes. To disclose the best representation of data quality, the Financed Emissions Standard requires that financial institutions normalize the data quality scores for each asset class and sector to the total outstanding loan or investment amount.

The equation for calculating weighted averages for an asset class or sector is:

$$= \frac{\sum_{i=1}^{n} Oustanding\ amount_i\ x\ Data\ quality\ score_i}{\sum_{i=1}^{n} Oustanding\ amount_i}$$

(with i=borrower or investee)

An illustrative example of a financial institution's lending is provided below:

Asset class	Sector	Company	Outstanding loan	Attributed scope 1 and 2 absolute emissions (kton CO_2e)	Data quality score (1=high, 5=low)
Business loans	Oil & Gas	Company A	522,425	15	3
Business loans	Oil & Gas	Company B	187,449	7	5
Business loans	Cattle farming	Company C	82,778	8	1
Business loans	Cattle farming	Company D	108,997	11	1
Business loans	Cattle farming	Company E	67,556	7	2
Business loans	Cattle farming	Company F	54,762	5	5

Weighted data quality score for business loans scope 1 and 2 emissions:

$$\frac{(522{,}425\ \times 3) + (187{,}449 \times 5) + (82{,}778 \times 1) + (108{,}997 \times 1) + (67{,}556 \times 2) + (54{,}762 \times 5)}{(522{,}425 + 187{,}449 + 82{,}778 + 108{,}977 + 67{,}556 + 54{,}762)} = \mathbf{3.03}$$

Weighted data quality score for oil & gas sector scope 1 and 2 emissions:

$$\frac{(522{,}425\ \times 3) + (187{,}449 \times 5)}{(522{,}425 + 187{,}449)} = \mathbf{3.53}$$

6.2 Optional reporting on undrawn loan commitment according to IFRS S1 & S2

INTRODUCTION

This section outlines the Partnership for Carbon Accounting Financials' (PCAF's) optional approach to ensuring interoperability between Part A of the PCAF Standard and the International Financial Reporting Standard (IFRS) S2 by defining a calculation method for financed emissions[197] from undrawn loan commitments. With national regulations increasingly aligned with IFRS S1 and S2, PCAF recognizes the imperative to include a harmonized methodology in Part A. This enables financial institutions to fully comply with IFRS S2 reporting requirements and ensure comparability of reported emissions associated with financial activities.

The calculation methodology for undrawn loans was built off pre-existing Part A methodology. It is to be seen as an additional calculation methodology to the relevant asset classes to account for and report financed emissions from undrawn loan commitments, which are in nature different from the calculation methodologies of drawn financing as provided in the PCAF Standard.

IFRS reporting requirements

The IFRS is a public interest organization that develops accounting and disclosure standards. With the formation of the International Sustainability Standards Board (ISSB) in 2021, IFRS consolidated the Climate Disclosure Standards Board (CDSB) and the Value Reporting Function (VRF). The result of this consolidation is the International Sustainability Standards Board (ISSB), which has developed the Sustainability Disclosure Standards IFRS S1 and IFRS S2. IFRS S1 and S2 aim to provide consistent and comparable information on an organization's ESG performance, sustainability-related risks and opportunities, and the potential financial impacts of sustainability issues. By embedding sustainability within financial reporting, ISSB aims to enhance transparency, accountability, and decision-making for stakeholders.

IFRS S1 requires companies (including financial institutions) to disclose material information on their sustainability-related risks and opportunities, covering four core reporting requirements: governance, strategy, risk management, as well as metrics and targets associated with sustainability-related risks and opportunities.

IFRS S2 specifies the disclosure requirements to identify climate-related risks and opportunities. It requires reporting on physical and transition risks, scenario analysis, financial effects, and metrics and targets. Per the IFRS S2 requirements, when reporting on metrics and targets, organizations should disclose qualitative and quantitative information including the reporting of scope 1, 2, and 3 GHG emissions. For scope 3 category 15 investments, IFRS S2 has specific requirements for commercial banking and the insurance

[197] Financed Emissions" is used here for consistency with reporting terminology, though PCAF recognizes that undrawn loan commitments are not yet financed.

industry. These requirements include disclosing scope 3 category 15 emissions of the following asset classes: loans, bonds, equity investment, project finance and undrawn loan commitments.

To enable financial institutions to comply with the reporting requirements of IFRS S2, the following methodology on undrawn loans has been developed.

Figure 6.2-1. Asset class comparison between IFRS S2 and the PCAF Standard for Part A

IFRS S2 Asset Class Categorization	PCAF Asset Class Categorization
Loans	Business loans & unlisted equity
Bonds	Listed equity & corporate bonds
Equity Investment	Unlisted or listed equity
Project Finance	Project finance
Undrawn loan commitments	**Not applicable**

UNDRAWN LOAN COMMITMENTS

The PCAF Part A Standard provides an optional methodology for calculating emissions associated with undrawn loan commitments. While the standard continues to follow the principle of "follow the money" by prioritizing actual financial flows during the reporting period, it also recognizes the importance of accounting for potential future oriented financial exposures. Undrawn loan commitments – agreements by which financial institutions offer clients the option to access funds under predefined terms in future periods – are now incorporated into emissions reporting. Although it remains challenging for financial institutions to predict the exact timing and extent of drawdowns, the updated methodology provides a standardized approach to estimate associated emissions, enhancing the completeness and comparability of financed emissions disclosures and enabling compliance to IFRS S2.

The need for a harmonized approach

The inclusion of undrawn loan commitments as an optional Part A methodology reflects the need for a harmonized approach that acknowledges their distinct nature from drawn loans and enables financial institutions to comply with IFRS S2. Unlike drawn loans, undrawn commitments are forward-looking, variable in amount, and not classified as a separate asset class. They require dedicated capital reserves and cannot be aggregated with drawn loans without risking inaccurate emissions reporting. Their fluctuating nature within a fiscal year complicates balance sheet representation, and the absence of a clear, industry-wide definition—particularly from IFRS—further challenges consistent measurement. Recognizing these complexities, the PCAF methodology now provides a framework that enables financial institutions to differentiate, and report financed emissions from undrawn commitments in alignment with IFRS S2, ensuring more accurate and comparable financed emissions disclosures.

Definition of undrawn loan commitments

There is currently no universally accepted definition of undrawn loan commitments within the financial industry. Undrawn loan commitments can be defined as loan arrangements where a credit limit is set for the client over a certain period, allowing them to borrow and repay funds any number of times within the limit. It refers to the maximum amount available to be drawn under a committed loan facility at a specific point in time, including facilities that are unconditionally cancellable, from which any amounts already drawn at that time are subtracted.

In the case a financial institution decides to report financed emissions from undrawn loan commitments they **should** do so for those undrawn loans that meet the suggested definition above, or another definition that is transparently disclosed. Financing products such as revolving credit facilities, bridge loans, and letters of credit which have committed values on the year-end balance sheet of the financial institution **may** be considered. General corporate purpose financing or lending that is designated for specific purposes (i.e. with known use of proceeds) **may** also be considered, if in line with the undrawn loan commitment definition outlined above.

Given the lack of an industry-wide definition for undrawn loans, to ensure transparency in reporting, FIs that decide to report using this methodology **shall** disclose their definition of undrawn loans by highlighting what financial products have been included in the calculation. If the financial institution excludes specific financial products or cases of undrawn loans, this **shall** be disclosed transparently together with justification for the exclusion.

Emissions scopes covered

For the calculation of emissions associated with undrawn loan commitments, the applicable emission scopes **shall** be determined by referencing the methodology of the respective asset class. Consequently, the emission scopes covered for each underlying asset **shall** align with the requirements specified in the section Emission scopes covered of the relevant asset class methodology.

Attribution of emissions

The calculation methodology for undrawn loan commitments builds upon the financed emissions calculation methodology outlined in Part A.

As a fundamental attribution principle, the financial institution allocates a portion of the borrower's potential annual emissions—assuming full utilization of the loan facility for business activities—based on the ratio of the undrawn loan commitment amount (numerator) to the enterprise value of the financed company (denominator).

The attribution factor reflects the proportional share of a company, calculated as the ratio of the outstanding loan amount to EVIC for listed companies, and to the sum of total equity and debt for private companies.

When calculating emissions associated with undrawn loans for asset classes where the attribution factor differs from the one described above, reference should be made to the 'Attribution of Emissions' section for each relevant asset class in Part A.

CALCULATION METHODOLOGY

Equations to calculate financed emissions of undrawn loans

If reported financed emissions from undrawn loan commitments shall be calculated by multiplying the attribution factor by the borrower's emissions. This calculation **may** include a weighting factor to reflect partial commitment usage. Accordingly, two calculation approaches are available:

1. An unweighted calculation approach, based on the total committed amount, which **shall** be reported by the financial institution; and
2. A weighted calculation approach, incorporating a weighting factor for partial commitment usage, which **may** be reported by the financial institution[198].

The unweighted calculation represents the theoretical maximum emissions exposure, based on the assumption that the full undrawn commitment will be utilized. This approach aligns with the principle of completeness and serves as a standardized baseline for comparison across financial institutions.

In cases where a financial institution reports weighted financed emissions from undrawn loan commitments, it **shall** also report the corresponding unweighted emissions. By presenting both figures, financial institutions can offer a more balanced view of their potential and expected climate-related financial exposure, thereby enhancing the credibility and decision-usefulness of their disclosures. Financial institutions **shall** disclose the rationale for applying a weighting factor, the methodology used to determine its value, and the asset classes and industries to which it applies. Disclosures **shall** also include any underlying assumptions, data sources, and estimation techniques used in the determination process of the weighting factor. Any changes to the weighting factor, methodology, or assumptions across reporting periods **shall** be clearly reported.

For undrawn loan commitments to private companies:

$$Financed\ emissions = \sum_{C} \frac{Undrawn\ loan\ commitment_c}{Total\ equity + debt_c} * Company\ emissions_c$$

[198] A financial institution may introduce a weighting factor to account for partial commitment usage. The weighted calculation introduces a weighting factor to adjust for the likelihood of actual client drawdown, which **may** be based on institution-, industry-, or region-specific utilization patterns. PCAF does not prescribe a specific methodology for determining this weighting factor. If a financial institution chooses to report both the unweighted and weighted emissions associated with undrawn loan commitments, it **shall** also disclose the methodology used to calculate the weighting factor, along with the factor itself.

For undrawn loan commitments to listed companies:

$$Financed\ emissions = \sum_{c} \frac{Undrawn\ loan\ commitment_c}{Enterprise\ Value\ Including\ Cash_c} * Company\ emissions_c$$

For the numerator, the maximum undrawn loan commitment is applied. The undrawn loan commitment represents the difference between the total loan commitment and the drawn amount (on a gross exposure basis) at the given point in time.

$$Undrawn\ loan\ commitment = Total\ loan\ commitment - drawn\ amount$$

The denominator is defined as either EVIC or the sum of total equity and debt, depending on the type of company, and **shall** be consistent with the methodology used to calculate financed emissions for the drawn portion of the loan.

GENERAL CHARACTERISTICS OF UNDRAWN LOAN CALCULATIONS

Asset classes in scope

The calculation of undrawn loan commitments applies to committed on-balance sheet loans and credit facilities where the concept of undrawn commitments is relevant. Applicable Part A asset classes may include Business Loans and Unlisted Equity, Project Finance, and other financial products at the discretion of the financial institution.

It is important to note that an undrawn loan commitment is not a distinct asset class but rather a condition of a loan (i.e., funds not yet drawn). This methodology is designed to enable financial institutions to meet the disclosure requirements established under IFRS.

If a financial institution excludes specific categories of undrawn loans from its disclosed emissions, such exclusions must be transparently reported. The disclosure shall include:

- The rationale for the exclusion; and
- The percentage of the excluded amount relative to total undrawn loan commitments.

Time of reporting

In line with Part A, GHG accounting enables financial institutions to disclose financed emissions at a fixed point in time and in line with financial accounting periods. Hence, the time of reporting emissions associated with undrawn loan commitments **shall** be aligned with the financial reporting as well as the reporting of financed emissions from drawn loans. This is also in line with the reporting requirements of IFRS S1 and S2.

Data quality score

The same calculation approaches for drawn loans are applied for the data quality score of undrawn loans. Financial institutions **should** use the most recent data with the highest quality available, even if it is

representative of different years, with the intention of aligning as much as possible. The data quality section for each asset class in Part A **shall** be referred to when determining the data quality score and which data to use.

Reporting requirements and recommendations

PCAF emphasizes the importance of reporting financed emissions from undrawn loan commitments separately from those associated with drawn loan commitments. This requirement is consistent with IFRS S2, which mandates the disclosure of emissions associated with undrawn loan commitments separately from emissions attributable to drawn amounts.

Accordingly, financial institutions subject to IFRS S2 **shall** disclose financed emissions from undrawn loan commitments separately from those associated with drawn loan commitments. This requirement applies in conjunction with the overarching reporting principles and recommendations outlined in Part A.

Glossary

PCAF®
Partnership for
Carbon Accounting
Financials

7. Glossary

Absolute emissions	Emissions attributed to a financial institution's lending and investing activity. Expressed in tonnes CO_2e. *See financed emissions*.
Amortization	Amortization in securitization refers to the process of repaying the principal amount of a loan or debt over time. In a securitization, as the principal amount of the underlying loans is repaid these funds are used to repay – or amortize – the ABS securities.
Asset back security	An asset-backed security (ABS) is a type of security that is secured by a specific pool of, generally financial, assets; these assets can be of a variety of types, including receivables, loans, or leases.
Asset class	A group of financial instruments that have similar financial characteristics.
Attribution factor	The share of total greenhouse gas (GHG) emissions of the borrower or investee that are allocated to the loan or investments.
Avoided emissions	Emission reductions that the financed project produces versus what would have been emitted in the absence of the project (the baseline emissions). In the context of the Financed Emissions Standard, avoided emissions are only from renewable power projects.
Biogenic carbon dioxide (CO2) emissions	Emissions from a stationary source directly resulting from the combustion or decomposition of biologically based materials other than fossil fuels.
Borrower	A person or company that borrows money from a bank.
Business loans and unlisted equity	This asset class comprises business loans and equity investments in private companies, also referred to as unlisted equity. Business loans include all on-balance sheet loans and lines of credit to listed and unlisted businesses, nonprofits, and any other structure of organization[199] and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol. Unlisted equity includes all on-balance sheet equity investments to businesses, nonprofits, and any other structure of organization that are not traded on a market and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol. *For detail information on this asset class, see subchapter 5.2*.
Capital structure/ capital stack	The hierarchy of debt that makes up the issuance of debt securities.
CO2 -equivalent (CO_2e)	The amount of CO2 that would cause the same integrated radiative forcing (a measure for the strength of climate change drivers) over a given time horizon as an emitted amount of another GHG or mixture of GHGs. Conversion factors vary based on the underlying assumptions and as the science advances. As a baseline, PCAF recommends using 100-year Global Warming Potentials without climate-carbon feedback from the most recent IPCC Assessment report.
Collateral	Any contractual rights, property or financial or physical assets (such as vehicles or equipment) with monetary value, given as security for repayment of a debt.

[199] This also includes governmental-owned enterprises (e.g., state-owned companies such as municipal energy or public transport providers), while loans to governments themselves are excluded. Loans to governments is covered under Sovereign Debt asset class.

Collateral attribution factor	The ratio of the outstanding loan secured on the hard assets to the total value of the collateral.
Collateral pool	The pool of loans, leases or other form of collateral backing the securitization.
Commercial mortgage-backed security	A commercial mortgage-backed security (CMBS) is a debt security whose cash flow is backed by the principal and interest payments from a specified pool of loans that are secured by mortgages over commercial property.
Commercial real estate (CRE)	This asset class includes on-balance sheet loans for specific corporate purposes, namely the purchase and refinance of commercial real estate (CRE), and on-balance sheet investments in CRE when the financial institution has no operational control over the property. This definition implies that the property is used for commercial purposes, such as retail, hotels, office space, industrial, or large multifamily rentals. In all cases, the owner of the building uses the property to conduct income-generating activities. *For detailed information on this asset class see subchapter 5.4.*
Comprehensive Environmental Data Archive (CEDA) data	CEDA (Comprehensive Environmental Data Archive) by Watershed is a globally representative, spend-based emissions factor database designed to support robust Scope 3 greenhouse gas accounting. Covering 148 countries and 400 industries, CEDA links economic activity to environmental impact using a multi-regional input-output model. It offers over 60,000 emission factors with high sectoral granularity and annual updates to reflect global decarbonization trends.
Consolidation approach	Refers to how an organization sets boundaries for GHG accounting. Types include equity share approach, financial control, and operational control.
Consumer finance	Finance provided to individual and household consumers, such as mortgages and motor vehicle loans.
Corporate debt	Money that is owed by companies rather than by governments or individual people.
Covered bond	Debt securities whose repayment is a corporate obligation of the issuer but are also backed by cash flows from mortgage loan receivables in a mortgage cover bond.
Debt	A financing instrument that requires repayment by the borrower. In the context of this Financed Emissions Standard, debt refers only to the principal amount owed by the borrower and excludes interest.
Direct emissions	Emissions from sources that are owned or controlled by the reporting entity or the borrower or investee.
Double counting	Occurs when GHG emissions (generated, avoided, or removed) are counted more than once in a GHG inventory or toward attaining mitigation pledges or financial pledges for the purpose of mitigating climate change.
Embodied emissions in buildings	The GHG emissions associated with the non-operational phase of the project. This includes emissions caused by extraction, manufacture, transportation, assembly, maintenance, replacement, deconstruction, disposal and end of life aspects of the materials and systems that make up a building.
Emission impact	In the context of this Financed Emissions Standard, emission impact refers to the emissions financed by loans and investments.
Emission intensity metric	Emissions per a specific unit, for example: tCO_2e/€M or $M invested, tCO_2e/MWh, tCO_2e/tonne product produced, tCO_2e/MWh, tCO_2e/ton product produced, tCO_2e/€M or $M company revenue.

Emission removals	The action of removing GHG emissions from the atmosphere and store it through various means, such as in soils, trees, underground reservoirs, rocks, the ocean, and even products like concrete and carbon fiber.
Emission risk	The potential for adverse effects on lives, livelihoods, health status, economic, social and cultural assets, services (including environmental), and infrastructure due to climate change.
Emission scopes	The GHG Protocol Corporate Accounting and Reporting Standard classifies an organization's GHG emissions into three scopes. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting organization, including both upstream and downstream emissions.
Enterprise Value Including Cash (EVIC)	The sum of the market capitalization of ordinary shares at fiscal year end, the market capitalization of preferred shares at fiscal year-end, and the book values of total debt and minorities' interests. No deductions of cash or cash equivalents are made to avoid the possibility of negative enterprise values.
Environmentally extended input-output (EEIO) data	EEIO data refers to EEIO emission factors that can be used to estimate scope 1, 2, and upstream scope 3 GHG emissions for a given industry or product category. EEIO data is particularly useful in screening emissions sources when prioritizing data collection efforts.
Equity	The ownership of banks or investors in a company or project. There are various types of equity, but equity typically refers to shareholder equity, which represents the amount of money that would be returned to a company's shareholders if all company assets were liquidated and all company debt were paid off.
Equity tranche	The most junior tranche of securitization, and it is the first to suffer losses if the underlying asset defaults.
EXIOBASE	A global, detailed multi-regional environmentally extended supply-use table and input-output table. It was developed by harmonizing and detailing supply use tables for a large number of countries, estimating emissions, and resource extractions by industry.
Facilitated emissions	In the context of securitization and structured products, facilitated emissions are the emissions related to the transactions facilitated by financial institutions, such as holding securities during the transfer from originator to investors.
Federal Test Procedure	The US Environmental Protection Agency's Federal Test Procedures are a series of drive cycle tests to measure the tailpipe emissions and fuel efficiency of passenger cars.
Financed emissions	Absolute emissions that banks and investors finance through their loans and investments, including those associated by assets held in structured products. *See absolute emissions.*
Financial institution	A company engaged in the business of dealing with financial and monetary transactions such as deposits, loans, investments, and currency exchange. Financial institutions encompass a broad range of business operations within the financial services sector, including commercial banks, investment banks, development banks, asset owners/managers (mutual funds, pension funds, close-end funds, investment trusts), and insurance companies.
Greenhouse gas (GHG) emissions	The seven gases mandated under the Kyoto Protocol and to be included in national inventories under the United Nations Framework Convention on

	Climate Change (UNFCCC)—carbon dioxide (CO2), methane (CH4), nitrous oxide (N2 O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3).
GHG accounting	A means of measuring the direct and indirect emissions to the Earth's biosphere of CO_2 and its equivalent gases from industrial activities.
GHG accounting of financial portfolios	The annual accounting and disclosure of GHG emissions associated with loans and investments at a fixed point in time in line with financial accounting periods. This is also called portfolio GHG accounting.
GHG Protocol	Comprehensive global standardized frameworks to measure and manage GHG emissions from private and public sector operations, value chains, and mitigation actions. The GHG Protocol supplies the world's most widely used GHG accounting standards. The Corporate Accounting and Reporting Standard provides the accounting platform for virtually every corporate GHG reporting program in the world.
Global Trade Analysis Project (GTAP) database	GTAP is a global network of researchers and policy makers conducting quantitative analysis of international policy issues. GTAP is coordinated by the Center for Global Trade Analysis in Purdue University's Department of Agricultural Economics. The centerpiece of the GTAP is a global database describing bilateral trade patterns, production, consumption, and intermediate use of commodities and services.
Home equity line of credit (HELOC)	A revolving line of credit usually with an adjustable interest rate, which allows homeowners to borrow up to a certain amount over a period of time. HELOCs work in a manner similar to credit cards, where the homeowner can continuously borrow up to an approved limit while paying off the balance.
Home equity loan (HEL)	Sometimes referred to as a second mortgage, usually allows homeowners to borrow a lump sum against their current home equity for a fixed rate over a fixed period of time. Usually, home equity loans are used to finance large expenditures, such as home repairs or college tuition.
Indirect emissions	Emissions that are a consequence of the activities of the reporting entity but occur at sources owned or controlled by another entity.
Interest-only (IO) strip	A debt security whose entitlements relate solely to payment of interest (no principal payments). The debt security does not have a principal balance, and interest payments are calculated on a notional balance which may be fixed or changed over time.
Investment	The term investment (unless explicitly stated otherwise) is used in the broad sense: "Putting money into activities or organizations' with the expectation of making a profit." Most forms of investment involve some form of risk taking, such as investment in equities, debt, property, projects, and even fixed interest securities which are subject to inflation risk, among other risks.
Investment attribution factor	The ratio of the nominal amount of a class of debt securities to the total nominal amount of all debt securities.
Investee company or investee project	A company or project in which an investor makes a direct investment.
Issuer	The entity which issues the bonds off the back of the collateral pool associated with the securitization.
Known use of proceeds	Known use of proceeds relates to investments and loans made via Use of Proceeds structures.

Listed equity and corporate bonds	This asset class includes all on-balance sheet listed corporate bonds and all on-balance sheet listed equity that are traded on a market and are for general corporate purposes, i.e., unknown use of proceeds as defined by the GHG Protocol. *For detailed information on this asset class see subchapter 5.1*.
Loan to value ratio (LTV or LVR)	A percentage calculated by dividing the loan amount by the value of the property used as Security for the Loan.
Loan attribution factor	A factor that determines the share of loan emissions attributed to the collateral pool.
Mezzanine debt security	A Subordinated Debt Security, which therefore ranks below a senior ranking Debt Security, but ranks above the most Subordinated Debt Security in the structure (generally the unrated equity or First Loss Piece).
Mortgages	This asset class includes on-balance sheet loans for specific consumer purposes - namely the purchase and refinance of residential property, including individual homes and multi-family housing with a small number of units. This definition implies that the property is used only for residential purposes and not for commercial activities. *For detailed information on this asset class see subchapter 5.5*.
Motor vehicle loans	This asset class refers to on-balance sheet loans and lines of credit to businesses and consumers for specific (corporate or consumer) purposes - namely the finance one or several motor vehicles. *For detailed information on this asset class see subchapter 5.6*.
On-balance sheet securitization structures	An accounting treatment whereby an Originator recognizes securitized Assets on its own balance sheet for capital treatment purposes (although legally the assets may have been sold to a securitization SPV).
Off-balance sheet securitization structures	An accounting treatment whereby an Originator is entitled to remove securitized Assets from its own balance sheet for capital purposes although the assets may not actually have been sold.
Originator	Refers to the originator, sponsor, or original lender of the loan(s).
Pool of Pools	The assembly of pools of investments in individual securitizations of loans (Pools) and associated collateral by Originators as the basis for securitization issuance.
Project finance	This asset class includes all on-balance sheet loans or equities to projects or activities that are designated for specific purposes, i.e., with known use of proceeds as defined by the GHG Protocol and is self-contained (i.e. the project has its own budget). The financing is designated for a defined activity or set of activities, such as the construction and operation of a gas-fired power plant, a wind or solar project, or energy efficiency projects. *For detailed information on this asset class see subchapter 5.2*.
Residential mortgage-backed security (RMBS also sometimes MBS)	A debt security whose cash flow is backed by the payments from a specified pool of loans that are secured by mortgages over residential property.
Ringfencing	Ringfencing is a legal technique that isolates the assets of securitization from the assets of the originator. In the context of securitization, it is used to protect investors from losses in the event of the originator's bankruptcy. Ring-fencing is typically achieved by creating a special purpose vehicle (SPV) to hold the assets of the securitization.

Scenario analysis	A process of analyzing future events by considering alternative possible outcomes.
Scope 1 emissions	Direct GHG emissions that occur from sources owned or controlled by the reporting company—i.e., emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.
Scope 2 emissions	Indirect GHG emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company. Scope 2 emissions physically occur at the facility where the electricity, steam, heating, or cooling is generated.
Scope 3 emissions	All other indirect GHG emissions (not included in scope 2) that occur in the value chain of the reporting company. Scope 3 can be broken down into upstream emissions and downstream emissions: Upstream emissions include all emissions that occur in the life cycle of a material/product/service up to the point of sale by the producer, such as from the production or extraction of purchased materials. Downstream emissions include all emissions that occur as a consequence of the distribution, storage, use, and end-of-life treatment of the organization's products or services.
Scope 3 category 15 (investments) emissions	This category includes scope 3 emissions associated with the reporting company's loans and investments in the reporting year, not already included in scope 1 or scope 2.
Securitization	A technique that converts cash flows from Assets into tradable Debt Securities which are limited in recourse to those Assets rather than the company that originated those Assets. The debt securities may be tranched, depending on market demand, allowing investors to take exposure to the transaction in line with their risk appetite.
Securitizations and structured products	This method covers securitized and structured products which are backed by identifiable loans, leases, or other income-generating assets. Typically, the collateral pool is sold to a bankruptcy-remote special-purpose vehicle (SPV) or similar entity, or referenced and the vehicle issues bonds to investors secured on the collateral. It encompasses both public and private asset-backed structures. The underlying collateral may include various asset types, and an evaluation of these assets must be performed to determine the applicable financed emissions methodology. *For detailed information on this asset class see subchapter 5.8.*
Senior tranche	The tranche that has the highest priority of payment in the event of default.
Sequestered emissions	Refers to atmospheric CO2 emissions that are captured and stored in solid or liquid form, thereby removing their harmful global warming effect.
Sovereign debt	This asset class includes sovereign bonds and sovereign loans of all maturities issued in domestic or foreign currencies. Both sovereign loans and bonds lead to the transfer of funds to the country, which in turn creates a debt obligation to be repaid by the borrowing country. *For detailed information on this asset class see subchapter 5.9.*
Special purpose vehicle (or trust or special purpose entity or designated activity company – SPV, SPE, DAC)	A bankruptcy-remote legal structure that holds assets off or/separate from the originator's balance sheet, which then issues securities in the form of ABS/structured products.

Structured product data quality score	Separate from the PCAF data quality score table found in Part A, the structured product data quality score provides guidance on calculating the deal data quality score.
Sub-sovereign debt	This asset class includes bonds and loans issued by public authorities below the national level — such as states, provinces, regions, cities, or municipalities — in either domestic or foreign currency. *For detailed information on this asset class see subchapter 5.10.*
Subordinated debt security	Debt Security which ranks behind other Debt Securities in repayment of Principal and is allocated losses before senior Debt Securities.
Synthetic securitizations	A type of transaction where the credit risk is transferred to the capital markets, but the assets remain on the originator's balance sheet.
Total balance sheet value	A balance sheet is a financial statement that reports a company's assets, liabilities, and shareholders' equity. The balance sheet value refers to the sum of total equity and liabilities, which is equal to the company's total assets.
Tranche	Tranche means each of the separate elements of the principal liabilities of the securitization (e.g. class of notes which, when taken together at their nominal original amount, equal the nominal outstanding amount of the loans in the pool of Assets at the closing of the deal.
Tranche attribution factor	The ratio of the outstanding nominal amount of a tranche to the total outstanding nominal amounts of all tranches.
Undrawn loan commitments	Undrawn loan commitments may be defined as loan arrangements where a credit limit is set for the client over a certain period, allowing them to borrow and repay funds any number of times within the limit. It refers to the maximum amount available to be drawn under a committed loan facility at a specific point in time, including facilities that are unconditionally cancellable, from which any amounts already drawn at that time are subtracted. *For detailed information on the optional IFRS reporting on undrawn loan commitments see subchapter 6.2.*
Unknown use of proceeds	Unknown use of proceeds refers to investments and loans for general (corporate or consumer) purposes, i.e., the financial institution does not know exactly for what activity the money is used, which holds for general-purpose loans.
Unlisted equity	All on-balance sheet equity investments to businesses, nonprofits, and any other structure of organization that are not traded on a market and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol. Unlisted equity is also referred to as equity investments in private companies (i.e., the financial institution obtains shares of the company).
Use of proceeds structures	Use of proceeds structures are structures containing a pool of one or multiple underlying assets. The term Use of proceeds structure is an abstract GHG accounting concept with a wide scope – it encompasses structures ranging from equity funds, debt funds and special purpose vehicles to labeled bonds and labeled loans. This method includes all on-balance sheet debt and equity to use of proceeds structures. Use of proceeds structures contain a pool of one or multiple underlying assets, which may belong to any asset class. Use of proceeds accounting allows financial institutions to account for the specific assets being financed. *For detailed information on this asset class see subchapter 5.7.*
Vehicle make	The name of the company that manufactures the vehicle.

Vehicle model	The product name of the vehicle.
Whole loan securitization	A whole loan is a single loan securitization issued by an originator/sponsor that is not included in a tranched securitization but is still ringfenced from the originator's assets. It can be kept on the lender's balance sheet or sold to investors.
World Input-Output Database (WIOD)	World Input-Output tables and underlying data, covering 43 countries, and a model for the rest of the world for 2000-2014. Data for 56 sectors are classified according to the International Standard Industrial Classification revision 4 (ISIC REV. 4).
World Harmonized Light-duty Vehicles Test Procedure (WLTP)	The WLTP is a global, harmonized standard of drive cycle tests to determine the tailpipe emissions and fuel efficiency of passenger cars.

Acronyms

PCAF®
Partnership for
Carbon Accounting
Financials

8. Acronyms

CAF	Collateral attribution factor
CDP	Carbon Disclosure Project
CH4	Methane
CO2	Carbon dioxide
CO2 e	Carbon dioxide equivalent
CRE	Commercial real estate
EEIO	Environmentally extended input-output
EU	European Union
EU TEG	European Commission Technical Expert Group on Sustainable Finance
EV	Electric vehicle
EVIC	Enterprise value including cash
FAO	Food and Agriculture Organization of the United Nations
FSB	Financial Stability Board
GAAP	Generally accepted accounting principles
GEMIS	Global Emissions Model for integrated Systems
GHG	Greenhouse gas
GTAP	Global Trade Analysis Project
HFC	Hydrofluorocarbon
HEL	Home equity loan
HELOC	Home equity line of credit
ICCT	International Council on Clean Transportation
IEA	International Energy Agency
IFI	Internal Financial Institution
IFRS	International Financial Reporting Standards
IPCC	Intergovernmental Panel on Climate Change
IPO	Initial public offering
ISIC	Industrial Classification of All Economic Activities
ITF OECD	International Transport Forum at the Organisation for Economic Co-operation and Development
ktCO2 e	Kilotonnes of carbon dioxide equivalent
LAF	Loan attribution factor

L2	Level 2 (NACE)
MtCO2 e	Megatonnes of carbon dioxide equivalent
MWh	Megawatt-hour
N2O	Nitrous oxide
NACE	Statistical Classification of Economic Activities in the European Community
NDC	Nationally determined contribution
NEDC	New European Driving Cycle
NF3	Nitrogen trifluoride
NGO	Nongovernmental organization
PCAF	Partnership for Carbon Accounting Financials
PFC	Perfluorocarbon
SASB	Sustainability Accounting Standards Board
SBT	Science-based targets
SBTi-FI	Science Based Targets initiative for Financial Institutions
SDA	Sectoral Decarbonization Approach
SF6	Sulfur hexafluoride
SSP	Securitization and Structured Products asset class
SVP	Special purpose vehicle
TAF	Tranche attribution factor
TCFD	Task Force on Climate-related Financial Disclosures
tCO2 e	Metric tonnes of carbon dioxide equivalent
UoP	Use of Proceed Structures
UNEP FI	United Nations Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
WACI	Weighted Average Carbon Intensity
WBCSD	World Business Council for Sustainable Development
WIOD	World Input-Output Database
WLTP	Worldwide Harmonized Light Vehicles Test Procedure

References

PCAF®
Partnership for
Carbon Accounting
Financials

9. References

- CDP. (2020). CDP Climate Change 2020 Questionnaire. Retrieved from CDP: https://bit.ly/39d9zoE
- CRO Forum. (2020). Carbon Footprinting Methodology for Underwriting Portfolios. Retrieved from The CRO Forum: https://www.thecroforum.org/wp-content/uploads/2020/05/CRO-Carbon-Foot-Printing-Methodology.pdf
- ENCORD. (2012). Construction CO2 e Measurement Protocol: A Guide to reporting against the Green House Gas Protocol for construction companies. Retrieved from Greenhouse Gas Protocol: https://ghgprotocol.org/sites/default/files/ENCORD-Construction-CO2- Measurement-Protocol-Lo-Res_FINAL_0.pdf
- EU Technical Expert Group on Sustainable Finance. (2019). Financing a Sustainable European Economy: Report on Benchmarks: Handbook of Climate Transition Benchmarks, Paris Aligned Benchmark, and Benchmarks' ESG Disclosure. Retrieved from European Commission: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/192020-sustainable-finance-teg-benchmarks-handbook_en_0.pdf
- GHG Protocol. (2014). Global Warming Potential Values. Retrieved from The Greenhouse Gas Protocol: https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf
- ICMA. (2020). Handbook - Harmonized Framework for Impact Reporting. Retrieved from International Capital Market Association: https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Handbook-Harmonized-Framework-for-Impact-Reporting-December-2020-151220.pdf
- ICMA. (2025). Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds. Retrieved from International Capital Market Association: https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks/green-bond-principles-gbp/
- IFI. (2020). Methodological Approach for the Common Default Grid Emission Factor Dataset. Retrieved from United Nations Framework Convention on Climate Change: https://unfccc.int/sites/default/files/resource/IFITWG_Methodological_approach_to_common_dataset.pdf
- New Climate Institute and Climate Analytics. (2020). Climate Action Tracker. Retrieved from https://climateactiontracker.org/global/cat-thermometer/
- PCAF. (2019, December). Accounting for and Steering Carbon: Harmonised Approach for the Financial Sector. Retrieved from Partnership for Carbon Accounting Financials: https://carbonaccountingfinancials.com/files/downloads/1911-pcaf-report-nl.pdf?6253ce57ac
- PCAF. (2019, November). Harmonizing and Implementing a Carbon Accounting Approach for the Financial Sector in North America. Retrieved from Partnership for Carbon Accounting Financials: https://carbonaccountingfinancials.com/files/2019-10/20191028- pcaf-report-2019.pdf
- PCAF. (2019). Shaping the climate action journey for financial institutions: navigating through the cluster of climate initiatives. Retrieved from Partnership for Carbon Accounting Financials: https://carbonaccountingfinancials.com/files/2020-01/overview-initiatives-shaping-climate-action-journey-for-fis.pdf?ae36ae7be6

- SBTi. (2020). Financial Sector Science-Based Targets Guidance, Pilot Version. Retrieved from https://sciencebasedtargets.org/wp-content/uploads/2020/10/Financial-Sector-Science-Based-Targets-Guidance-Pilot-Version.pdf
- TCFD. (2017). Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures. Retrieved from https://www.fsb-tcfd.org/publications/final-recommendations-report/
- TCFD. (2017). Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures. Section D: Supplemental Guidance for the Financial Sector. Retrieved from Task Force on Climate-related Financial Disclosures: https://www.fsb-tcfd.org/wp-content/uploads/2017/12/FINAL-TCFD-Annex-Amended-121517.pdf
- UNFCCC. (2015). International Financial Institution Framework for a Harmonised Approach to Greenhouse Gas Accounting. Retrieved from United Nations Framework Convention on Climate Change: https://unfccc.int/sites/default/files/resource/International%20 Financial%20Institution%20Framework%20for%20a%20Harmonised_rev.pdf
- World Bank Group. (2020). State and Trends of Carbon Pricing. Washington, D.C.
- WRI and WBCSD. (2004). GHG Protocol Corporate Accounting and Reporting Standard, Revised Edition, Chapter 2. Retrieved from The Greenhouse Gas Protocol: https:// ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf
- WRI and WBCSD. (2011). GHG Protocol, Corporate Value Chain (Scope 3) Accounting and Reporting Standard, Supplement to the GHG Protocol Corporate Accounting and Reporting Standard. Retrieved from Greenhouse Gas Protocol: https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf
- WRI and WBCSD. (2013). Technical Guidance for Calculating Scope 3 Emissions. Retrieved from Greenhouse Gas Protocol: https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf

Annex

PCAF®
Partnership for
Carbon Accounting
Financials

10. Annex

10.1 Detailed data quality score tables per asset class[200]

Table 10.1-1. Detailed description of the data quality score table for listed equity and corporate bonds[201]

Option	Description					Data quality
	Attribution		Emission factor		Financed emission calculation	Highest to lowest
	Financial data		Emissions data		Equations	
Option 1a	Outstanding amount in the company	EVIC for listed companies and total equity plus debt for bonds to private companies	Verified GHG emissions data from the company in accordance with the GHG Protocol		For listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Verified\ company\ emissions_c$ For bonds to private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Verified\ company\ emissions_c$	Score 1
Option 1b			Unverified GHG emissions data calculated by the company in accordance with the GHG Protocol		For listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Unverified\ company\ emissions_c$ For bonds to private companies: $\sum_c \frac{\text{Outstanding amount}_c}{\text{Total equity} + \text{debt}_c}\ \text{x Unverified company emissions}_c$	Score 2
Option 2a[202]			Primary physical activity data for the company's energy consumption by energy source (e.g., megawatt-hours of electricity) plus any process emissions	Emission factors specific to that primary data (e.g., energy source-specific emission factors)[203]	For listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Energy\ consumption_c$[204] $x\ Emission\ factor$ For bonds to private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Energy\ consumption_c$[205] $x\ Emission\ factor$	
Option 2b			Primary physical activity data for the company's production (e.g., tonnes of rice produced)	Emission factors specific to that primary data (e.g., emission factor per tonne of rice)	For listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Production_c\ x\ Emission\ factor$ For bonds to private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Production_c\ x\ Emission\ factor$	Scope 3
Option 3a			GHG emissions per sector	Revenue per sector[206]	For listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Revenue_c\ x\ \frac{GHG\ emissions_s}{Revenue_s}$ For bonds to private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Revenue_c\ x\ \frac{GHG\ emissions_s}{Revenue_s}$	Score 4
		Revenue of the company				
Option 3b		N/A	GHG emissions per sector	Assets per sector	For listed companies and bonds to private companies: $\sum_c Outstanding\ amount_c\ x\ \frac{GHG\ emissions_s}{Assets_s}$	Score 5
Option 3c		Asset turnover ratio per sector	GHG emissions per sector	Revenue per sector	For listed companies and bonds to private companies: $\sum_c Outstanding\ amount_c x\ Asset\ tunrover\ ratio_c\ x\ \frac{GHG\ emissions_s}{Revenue_s}$	

[200] Securitizations and Structured Products and Use of Proceeds Structures do not have separate detailed data quality score tables, as data quality is assessed based on the underlying assets. The detailed data quality tables of the relevant underlying asset classes should be used for these methods.
[201] Where c = borrower or investee company and s = sector.
[202] The quality scoring for Option 2a is only possible for/applicable to scope 1 and scope 2 emissions as scope 3 emissions cannot be estimated by this option. Other options can be used to estimate the scope 3 emissions, however.
[203] Supplier-specific emission factors (e.g., from an electricity provider) for the respective primary activity data are always preferred over non-supplier-specific emission factors.
[204] Where this option is used, process emissions must be added to the calculated energy consumption emissions before multiplying by the attribution factor.
[205] Where this option is used, process emissions must be added to the calculated energy consumption emissions before multiplying by the attribution factor.
[206] If revenue is not deemed a suitable financial indicator for estimating the emissions of a company in a certain sector, one can apply other suitable financial indicators as a proxy. If an alternative indicator is used, the reasoning for the selection of this alternative indicator should be made transparent. The data quality score will not be affected.

Table 10.1-2. Detailed description of the data quality score table for business loans and unlisted equity[207]

Option	Description					Data quality
	Attribution		Emission factor		Financed emission calculation	Highest to lowest
	Financial data		Emissions data		Equations	
Option 1a	Outstanding amount in the company	Total equity plus debt for business loans and equity investments to/in private companies, and EVIC for business loans to listed companies	Verified GHG emissions data from the company in accordance with the GHG Protocol		For business loans and equity investments to/in private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Verified\ company\ emissions_c$ For business loans to listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Verified\ company\ emissions_c$	Score 1
Option 1b			Unverified GHG emissions data calculated by the company in accordance with the GHG Protocol		For business loans and equity investments to/in private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Unverified\ company\ emissions_c$ For business loans to listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Unveified\ company\ emissions_c$	Score 2
Option 2a[208]			Primary physical activity data for the company's energy consumption by energy source (e.g., megawatt-hours of electricity) plus any process emissions	Emission factors specific to that primary data (e.g., energy source-specific emission factors)[209]	For business loans and equity investments to/in private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Energy\ consumption_c$[210] $x\ Emission\ factor$ For business loans to listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Energy\ consumption_c$[211] $x\ Emission\ factor$	
Option 2b			Primary physical activity data for the company's production (e.g., tonnes of rice produced)	Emission factors specific to that primary data (e.g., emission factor per tonne of rice)	For business loans and equity investments to/in private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Production_c\ x\ Emission\ factor$ For business loans to listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Production_c\ x\ Emission\ factor$	Score 3
Option 3a		Revenue of the company	GHG emissions per sector	Revenue per sector[212]	For business loans and equity investments to/in private companies: $\sum_c \frac{Outstanding\ amount_c}{Total\ equity + debt_c}\ x\ Revenue_c\ x\ \frac{GHG\ emissions_s}{Revenue_s}$ For business loans to listed companies: $\sum_c \frac{Outstanding\ amount_c}{EVIC_c}\ x\ Revenue_c\ x\ \frac{GHG\ emissions_s}{Revenue_s}$	Score 4
Option 3b		N/A	GHG emissions per sector	Assets per sector	$\sum_c Outstanding\ amount_c\ x\ \frac{GHG\ emissions_s}{Assets_s}$	Score 5
Option 3c		Asset turnover ratio per sector	GHG emissions per sector	Revenue per sector	$\sum_c Outstanding\ amount_c x\ Asset\ tunrover\ ratio_c\ x\ \frac{GHG\ emissions_s}{Revenue_s}$	

[207] Where c = borrower or investee company and s = sector.
[208] The quality scoring for Option 2a is only possible for/applicable to scope 1 and scope 2 emissions as scope 3 emissions cannot be estimated by this option. Other options can be used to estimate the scope 3 emissions, however.
[209] Supplier-specific emission factors (e.g., from an electricity provider) for the respective primary activity data are always preferred over non-supplier-specific emission factors.
[210] Where this option is used, process emissions must be added to the calculated energy consumption emissions before multiplying by the attribution factor.
[211] Where this option is used, process emissions must be added to the calculated energy consumption emissions before multiplying by the attribution factor.
[212] If revenue is not deemed a suitable financial indicator for estimating the emissions of a company in a certain sector, one can apply other suitable financial indicators as a proxy. If an alternative indicator is used, the reasoning for the selection of this alternative indicator should be made transparent. The data quality score will not be affected.

Table 10.1-3. Detailed description of the data quality score table for project finance[213]

Option	Description					Data quality
	Attribution		Emission factor		Financed emission calculation	Highest to lowest
	Financial data		Emissions data		Equations	
Option 1a	Outstanding amount in the project	Total equity plus debt for business loans and equity investments to/in private companies, and EVIC for business loans to listed companies	Verified GHG emissions data from the company in accordance with the GHG Protocol		$\sum_p \frac{Outstanding\ amount_p}{Total\ equity + debt_p}\ x\ Verified\ project\ emissions_p$	Score 1
Option 1b			Unverified GHG emissions data calculated by the company in accordance with the GHG Protocol		$\sum_p \frac{Outstanding\ amount_p}{Total\ equity + debt_p}\ x\ Unverified\ project\ emissions_p$	Score 2
Option 2a[214]			Primary physical activity data for the company's energy consumption by energy source (e.g., megawatt-hours of electricity) plus any process emissions	Emission factors specific to that primary data (e.g., energy source-specific emission factors)[215]	$\sum_p \frac{Outstanding\ amount_p}{Total\ equity + debt_p}\ x\ Energy\ consumption_p$[216] $x\ Emission\ factor$	
Option 2b			Primary physical activity data for the project's production (e.g., tonnes of rice produced)	Emission factors specific to that primary data (e.g., emission factor per tonne of rice)	$\sum_p \frac{Outstanding\ amount_p}{Total\ equity + debt_p}\ x\ Production_p\ x\ Emission\ factor$	Score 3
Option 3a		Total project equity and debt Revenue of the project	GHG emissions per sector	Revenue per sector[217]	$\sum_p \frac{Outstanding\ amount_p}{Total\ equity + debt_p}\ x\ Revenue_p\ x\ \frac{GHG\ emissions_s}{Revenue_s}$	Score 4
Option 3b		N/A	GHG emissions per sector	Assets per sector	$\sum_p Outstanding\ amount_p\ x\ \frac{GHG\ emissions_s}{Assets_s}$	Score 5
Option 3c		Asset turnover ratio per sector	GHG emissions per sector	Revenue per sector	$\sum_c Outstanding\ amount_c x\ Asset\ tunrover\ ratio_c\ x\ \frac{GHG\ emissions_s}{Revenue_s}$	

[213] Where c = borrower or investee company and s = sector.
[214] The quality scoring for Option 2a is only possible for/applicable to scope 1 and scope 2 emissions as scope 3 emissions cannot be estimated by this option. Other options can be used to estimate the scope 3 emissions, however.
[215] Supplier-specific emission factors (e.g., from an electricity provider) for the respective primary activity data are always preferred over non-supplier-specific emission factors.
[216] Where this option is used, process emissions must be added to the calculated energy consumption emissions before multiplying by the attribution factor.
[217] If revenue is not deemed a suitable financial indicator for estimating the emissions of a company in a certain sector, one can apply other suitable financial indicators as a proxy. If an alternative indicator is used, the reasoning for the selection of this alternative indicator should be made transparent. The data quality score will not be affected.

Table 10.1-4. Detailed description of the data quality score table for commercial real estate[218]

Option	Description				Data quality
	Attribution	Emission factor		Financed emission calculation	Highest to lowest
	Financial data	Emissions data		Equations	
Option 1a	Outstanding amount and property value at origination	Supplier-specific emission factors specific to the energy source	Primary data on actual building energy consumption	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Actual\ energy\ consumption_{b,e}\ x\ Supplier\ specific\ emission\ factor_e$	Score 1
Option 1b		Average emission factors specific to the energy source	Primary data on actual building energy consumption	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Actual\ energy\ consumption_{b,e}\ x\ Average\ emission\ factor_e$	Score 2
Option 2a			Estimated building energy consumption per floor area based on official building energy labels and floor area financed	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Estimated\ energy\ consumption\ from\ energy\ labels\ x\ Floor\ area_b\ x\ Average\ emission\ factor_e$	Score 3
Option 2b			Estimated building energy consumption per floor area based on building type and location-specific statistical data and floor area financed	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Estimated\ energy\ consumption\ from\ statistics_{b,e}\ x\ Floor\ area_b\ x\ Average\ emission\ factor_e$	Score 4
Option 3			Estimated building energy consumption per building based on building type and location-specific statistical data and number of buildings financed	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Estimated\ energy\ consumption\ from\ statistics_{b,e}\ x\ Number\ of\ buildings_b\ x\ Average\ emission\ factor_e$	Score 5

[218] Where b=building and e=energy source.

Table 10.1-5. Detailed description of the data quality score table for mortgages[219]

Option	Description				Data quality
	Attribution	Emission factor		Financed emission calculation	Highest to lowest
	Financial data	Emissions data		Equations	
Option 1a	Outstanding amount and property value at origination	Supplier-specific emission factors specific to the energy source	Primary data on actual building energy consumption	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Actual\ energy\ consumption_{b,e}\ x\ Supplier\ specific\ emission\ factor_e$	Score 1
Option 1b		Average emission factors specific to the energy source	Primary data on actual building energy consumption	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Actual\ energy\ consumption_{b,e}\ x\ Average\ emission\ factor_e$	Score 2
Option 2a			Estimated building energy consumption per floor area based on official building energy labels and floor area financed	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Estimated\ energy\ consumption\ from\ energt\ labels\ x\ Floor\ area_b\ x\ Average\ emission\ fctor_e$	Score 3
Option 2b			Estimated building energy consumption per floor area based on building type and location-specific statistical data and floor area financed	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Estimated\ energy\ consumption\ from\ statistics_{b,e}\ x\ Floor\ area_b\ x\ Average\ emission\ factor_e$	Score 4
Option 3			Estimated building energy consumption per building based on building type and location-specific statistical data and number of buildings financed	$\sum_{b,e} \frac{Outstanding\ amount_b}{Property\ value\ at\ origination_b}\ x\ Estimated\ energy\ consumption\ from\ statistics_{b,e}\ x\ Number\ of\ buildings_b\ x\ Average\ emission\ factor_e$	Score 5

[219] Where b=building and e=energy source.

Table 10.1-6. Detailed description of the data quality score table for motor vehicle loans[220]

Option	Description				Data quality
	Attribution	Emission factor		Financed emission calculation	Highest to lowest
	Financial data	Emissions data		Equations	
Option 1a	Outstanding amount and total value of vehicle or vehicle fleet at origination	Emission factors[221] specific to the fuel type	Primary data on actual vehicle fuel consumption	$\sum_{v,f} \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}\ x\ Fuel\ consumption_v\ x\ Emission\ factor_f$	Score 1
Option 1b			Primary data on actual vehicle distance traveled plus vehicle's fuel efficiency and fuel type from known vehicle make and model	$\sum_{v,f} \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}\ x\ Distance\ traveled_v\ x\ Efficiency_{v,f}\ x\ Emission\ factor_f$	
Option 2a			Local statistical data for distance traveled plus vehicle's fuel efficiency and fuel type from known vehicle make and model	$\sum_{v,f} \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}\ x\ Distance\ traveled_l\ x\ Efficiency_{v,f}\ x\ Emission\ factor_f$	Score 2
Option 2b			Regional statistical data for distance traveled plus vehicle's fuel efficiency and fuel type from known vehicle make and model	$\sum_{v,f} \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}\ x\ Distance\ traveled_r\ x\ Efficiency_{v,f}\ x\ Emission\ factor_f$	Score 3
Option 3a			Local or regional statistical data for distance traveled plus vehicle's fuel efficiency and fuel type from known vehicle type	$\sum_{t,f} \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}\ x\ Distance\ traveled_s\ x\ Efficiency_{t,f}\ x\ Emission\ factor_f$	Score 4
Option 3b			Local or regional statistical data for distance traveled plus vehicle fuel's efficiency and fuel type from average vehicle	$\sum_{a,f} \frac{Outstanding\ amount_v}{Total\ value\ at\ origination_v}\ x\ Distance\ traveled_s\ x\ Efficiency_{a,f}\ x\ Emision\ factor_f$	Score 5

[220] Where v = vehicle or vehicle fleet with known make and model for that vehicle, t = vehicle or vehicle fleet with known vehicle type, a = assumed average vehicle or vehicle fleet, l = local estimation of distance traveled, r = regional estimation of distance traveled, s = local or regional estimation of distance traveled, f = fuel type (fuel type in the case of electric or hybrid vehicles can also refer to electricity).

[221] Of all options shown in the table, supplier-specific emission factors (e.g., from an electricity provider) for the respective primary activity data are always preferred over non-supplier-specific emission factors.

Table 10.1-7. Detailed description of the data quality score table for sovereign debt[222]

Option	Description					Data quality
	Attribution		Emission factor		Financed emission calculation	Highest to lowest
	Financial data		Emissions data		Equations	
Option 1a	Outstanding amount (loan or bond) to the sovereign	PPP[223]-adjusted Gross Domestic Product (GDP)	Verified GHG emissions of the country, reported by the country to UNFCCC		$\sum_c \frac{Outstanding\ amount_c}{PPP-adjusted\ GDP_c}\ x\ Verified\ country\ emissions_c$	Score 1
Option 1b			Unverified GHG emissions of the country		$\sum_c \frac{Outstanding\ amount_c}{PPP-adjusted\ GDP_c}\ x\ Unverified\ country\ emissions_c$	Score 2
Option 2			Primary physical activity data of the country's energy consumption (domestic generated and imported) by energy source (e.g., megawatt-hours of electricity) plus any process emissions	Emission factors specific to that primary data (e.g., energy source-specific emission factors)	$\sum_c \frac{Outstanding\ amount_c}{PPP-adjusted\ GDP_c}\ x\ Energy\ consumption_c\ x\ Emission\ factor$	Score 3
Option 3a			GHG emissions per sector revenue	Revenue per sector[224]	$\sum_c \frac{Outstanding\ amount_c}{PPP-adjusted\ GDP_c}\ x\ Revenue_{s,c}\ x\ \frac{GHG\ emissions_{s,c}}{Revenue_{s,c}}$	Score 4
Option 3b			GHG emissions per PPP-adjusted GDP of proxy country	PPP-adjusted GDP of the country	$\sum_c \frac{Outstanding\ amount_c}{PPP-adjusted\ GDP_c}\ x\ PPP-adjusted\ GDP_c\ x\ \frac{GHG\ emissions_{proxy}}{PPP-adjusted\ GDP_{proxy}}$	Score 5

[222] Where c=country and s=sector.
[223] Purchasing power parity (PPP)
[224] If revenue is not deemed a suitable financial indicator for estimating the emissions of a company in a certain sector, one can apply other suitable financial indicators as a proxy. If an alternative indicator is used, the reasoning for the selection of this alternative indicator should be made transparent. The data quality score will not be affected.

Table 10.1-8. Detailed description of the data quality score table for sub-sovereign debt[225]

Option	Description					Data quality
	Attribution		Emission factor		Financed emission calculation	Highest to lowest
	Financial data		Emissions data		Equations	
Option 1a	Outstanding amount (loan or bond) to the sub-sovereign	PPP[226] adjusted Gross Domestic Product (GDP)	Verified GHG emissions of the sub-sovereign territory		$\sum_s \frac{Outstanding\ amount_s}{PPP-adjusted\ GDP_s}\ x\ Verified\ sub\text{-}sovereign\ emissions_s$	Score 1
Option 1b			Unverified GHG emissions of the sub-sovereign territory		$\sum_s \frac{Outstanding\ amount_s}{PPP-adjusted\ GDP_s}\ x\ Unverified\ sub\text{-}sovereign\ emissions_s$	Score 2
Option 2			Primary physical activity data of the sub-sovereign territory's energy consumption (domestic generated and imported) by energy source (e.g., megawatt-hours of electricity) plus any process emissions	Emission factors specific to that primary data (e.g., energy source-specific emission factors)	$\sum_s \frac{Outstanding\ amount_s}{PPP-adjusted\ GDP_s}\ x\ Energy\ consumption_s\ x\ Emission\ factor$	Score 3
Option 3			GHG emissions per sector revenue	Revenue per sector[227]	$\sum_s \frac{Outstanding\ amount_s}{PPP-adjusted\ GDP_s}\ x\ Revenue_{s,k}\ x\ \frac{GHG\ emissions_{s,k}}{Revenue_{s,k}}$	Score 4
Option 4a			GHG emissions per PPP-adjusted GDP of proxy region (one level above[228])	PPP-adjusted GDP of the proxy region	$\sum_s \frac{Outstanding\ amount_s}{PPP-adjusted\ GDP_s}\ x\ PPP-adjusted\ GDP_s\ x\ \frac{GHG\ emissions_{proxy}}{PPP-adjusted\ GDP_{proxy}}$	Score 5
Option 4b			GHG emissions per PPP-adjusted GDP of proxy region (two levels above[28])	PPP-adjusted GDP of the proxy region	$\sum_s \frac{Outstanding\ amount_s}{PPP-adjusted\ GDP_s}\ x\ PPP-adjusted\ GDP_s\ x\ \frac{GHG\ emissions_{proxy}}{PPP-adjusted\ GDP_{proxy}}$	

[225] Where s=sub-sovereign territory and k=sector.
[226] Purchasing power parity (PPP)
[227] If revenue is not deemed a suitable financial indicator for estimating the emissions of a company in a certain sector, one can apply other suitable financial indicators as a proxy. If an alternative indicator is used, the reasoning for the selection of this alternative indicator should be made transparent. The data quality score will not be affected.
[228] See Table 5.10-1 in Subchapter 5.10 on 'Sub-sovereign debt' for an explanation of the levels and an example of territory classification.

10.2. Sample table template displaying reported emissions for a given fiscal year

Table 10.2-1. Example of a GHG accounting report for scopes 1, 2, and 3

Scopes and categories	Baseline year emissions (tCO_2e) (if relevant)	Current reporting year emissions (tCO_2e)
Scope 1 emissions		
Total scope 1		
Scope 2 emissions		
Total scope 2		
Upstream scope 3 emissions		
Category 1: Purchased goods		
Category 2: Capital goods		
Category 3: Fuel- and energy-related activities		
Category 4: Upstream transportation and distribution		
Category 5: Waste generated in operations		
Category 6: Business travel		
Category 7: Employee commuting		
Category 8: Upstream leased assets		
Downstream scope 3 emissions		
Category 9: Downstream transportation and distribution		
Category 10: Processing of sold products		
Category 11: Use of sold products		
Category 12: End-of-life treatment of sold products		
Category 13: Downstream leased assets		
Category 14: Franchises		
Category 15: Investments**		
Total emissions all scopes		
Scope 1 total emissions		
Scope 2 total emissions		
Scope 3 total emissions		
Overall total emissions		

See Table 10.2-2 and Table 10.2-3 for examples how to report scope 3 category 15 (investments) emissions.

Table 10.2-2. Example reporting of absolute financed emissions—scope 3, category 15 (investments)

Activity	Total outstanding loan and investments covered (x € 1,000)	Scope 1+ Scope 2 emissions (tCO_2e)	Scope 3 emissions (tCO_2e)	Emission intensity (tCO_2e/€M)	Weighted data quality score (High Quality = 1 Low Quality = 5)
Absolute emissions per asset class (if reporting by asset class)					
Listed Equity & Bonds					
Business Loans					
-Sector 1, e.g., Cement					
-Sector 2, e.g., Cattle					
Project Finance					
Commercial Real Estate					
Mortgages					
Motor Vehicle Loans					
Use of Proceed Structures					
Securitization and Structured Products					
Sovereign Debt					
Sub-Sovereign Debt					
Total					
Absolute emissions per sector (if reporting by sector)					
Oil & Gas					
Agriculture					
Total					

Table 10.2-3. Example reporting of financed emission removals—scope 3, category 15 (investments)

Activity	Total outstanding loan and investments covered (x € 1,000)	Emissions (tCO_2e)	Emission intensity (tCO_2e/€M)	Weighted data quality score (High Quality = 1 Low Quality = 5)
Emissions removals from forestry projects				
Carbon credits generated				
Total				
Carbon credits retired				
Total				

Table 10.2-4. Example reporting of emissions associated with undrawn loan commitments according to IFRS S2 requirements (optional addition to report weighted emission numbers)

Breakdown by asset class	Breakdown by industry	Absolute gross financed emissions scope 1		Absolute gross financed emissions scope 2		Absolute gross financed emissions scope 3	
Undrawn loan commitment		Full amount	Optional: Weighted	Full amount	Optional: Weighted	Full amount	Optional: Weighted
	Total						
	By Industry						

10.3 Supplementary information for Sovereign Debt and Sub-Sovereign Debt

RATIONALE FOR USING PPP-ADJUSTED GDP

For a listed company, total value is measured by Enterprise Value Including Cash (EVIC). Applying the same logic to sovereigns and sub-sovereign issuers such as countries, local governments, or cities is more challenging because there is no appropriate measurement of equity for these entities. This leaves only outstanding debt in the denominator of the attribution factor. However, using debt alone for the attribution factor has limitations. Sovereigns and sub-sovereigns rarely finance themselves primarily through debt; tax revenues are a main source of income. Therefore, using outstanding national or local debt levels only (not including a measurement for equity) as the denominator for attribution makes the approach highly dependent on the extent of a government's debt. A debt (only) based denominator would also create inconsistencies between asset classes and weaken comparability, undermining one of PCAF's key objectives: a harmonized framework for financed emissions accounting.

Using per capita values in the denominator would not be reasonable for attributing production emissions, as this would only make sense for consumption-based emissions (which exclude emissions related to exported goods and services). To address these challenges and ensure a harmonized framework, PCAF recommends using PPP-adjusted GDP as a proxy for total value for sovereign and sub-sovereign issuers. This approach better reflects the economic capacity of these entities and aligns with the principle of proportional attribution.

PPP-Adjusted GDP for Sovereign Emission Attributions

The table below illustrates this point. Singapore and Hong Kong have fairly comparable scope 1 emissions (here excl. LULUCF, source: EDGAR) and similar GDP levels. However, the low level of outstanding debt contracted by Hong Kong relative to Singapore leaves a hypothetical investor (with equal $1 million USD investments in sovereign debt of both entities) with significant GHG emissions in Hong Kong compared with Singapore.

The attribution for this example is computed as follows:

$$\frac{Exposure\ to\ Sovereign\ Bond\ (USD)}{Debt\ of\ Country\ (USD)}\ x\ Scope\ 1\ Emissions\ (tCO2e)$$

Table 10.3-1. Example of (volatility of) attribution based on national debt

Country	Scope 1 emissions (tCO_2e)	Debt ($ Millions USD)	Exposure ($ Millions USD)	Debt Approach (tCO_2e)
Singapore	61,451,586	312,935	1	196
Hong Kong	42,654,105	159	1	268,264

As the example above shows, attributing emissions by government debt can generate unwanted incentives in portfolio steering.

These effects are also present in corporate emissions accounting, where emissions attributed to financial institutions are strongly dependent on the underlying enterprise value (EVIC) of the respective corporate. However, the impacts on portfolio steering tend to be less pronounced because the EVIC metric includes a measurement for equity (not attributing all emissions to debt) and given that a much larger universe of corporates exists compared with sovereigns.

Given the issue described above, this methodology uses an alternative approach to emissions attribution for sovereign debt allowing for a link to the real economy impact. This alternative involves taking Purchase Power Parity (PPP)-adjusted GDP (i.e., the value of a country's output as a proxy for the 'value of the country') adjusted by the PPP factor to improve the comparison between the actual economy sizes (see the Intensity Section below to demonstrate the comparison) and attribution of emissions by the sovereign's GDP:

$$Attributed\ Emissions = \frac{Exposure\ to\ Sovereign\ Bond\ (USD)}{PPP - adjusted\ GDP\ (USD)}\ x\ Scope\ 1\ Emissions\ (tCO2e)$$

Table 10.3-2. Comparison of attribution based on national debt versus the PPP-adjusted GDP approach

Country	Scope 1 emissions (tCO_2e)	Debt ($ Millions USD)	PPP-adjusted GDP ($ Millions USD)	Exposure ($ Millions USD)	Debt Approach (tCO_2e)	PPP-adjusted GDP approach (tCO_2e)
Singapore	61,451,586	312,935	579,762	1	196	106
Hong Kong	42,654,105	159	469,182	1	268,264	91

Given comparable sizes of the economies as measured by PPP-adjusted GDP, the countries would receive a more appropriate treatment in terms of financed emissions in financial portfolios.

The following table illustrates further examples of the difference in ranking by the two attribution factors. Relating emissions to the sizes of the economy and to produced output (PPP-adjusted GDP) allows for a potentially fairer treatment. For example, the US and Japan—two of the largest emissions producers in the world—would rank much more favorably by debt attribution factor given their relatively large sizes of outstanding debt.

Table 10.3-3. Example of difference in ranking by national debt and PPP-adjusted GDP approach

Country	Absolute Production Emissions Mt CO_2e	Gross government Debt ($ Millions USD)	PPP-adj. GDP ($ Millions Int'l)	Rank Production Emissions/ Debt	Rank by Production Emissions/ PPP adj. GDP
China	11.535	7.905.659	7.905.659	2	1
Australia	433	573.961	1.324.171	6	2
Canada	585	1.528.280	1.898.870	8	3
South Korea	652	667.605	2.209.424	5	4
India	2.597	1.980.623	9.560.220	3	5
United States	5.107	22.869.681	21.433.226	15	6
Japan	1.154	12.071.286	12.071.286	25	7
Thailand	275	225.431	1.342.165	4	8
Indonesia	626	327.789	3.338.144	1	9
Mexico	485	686.599	2.608.650	7	10
Belgium	104	530.794	628.371	16	11
Finland	43	161.257	285.024	12	12
Netherlands	156	472.075	1.031.484	9	13
Germany	703	2.198.292	4.644.166	10	14
Brazil	478	1.662.405	3.229.055	11	15
Austria	72	316.751	520.804	13	16
Spain	259	1.337.221	1.988.355	17	17
Portugal	48	285.248	378.124	18	18
Italy	332	2.673.312	2.677.118	23	19
United Kingdom	365	2.423.556	3.240.511	20	20
France	315	2.693.686	3.320.559	24	21
Singapore	53	406.936	579.763	22	22
Ireland	37	242.618	430.334	19	23
Sweden	45	197.622	565.620	14	24
Switzerland	39	277.619	602.641	21	25

Naturally, attribution by PPP-adjusted GDP is not the perfect metric, and countries with larger PPP-adjusted GDP receive a relatively more favorable treatment. For example, take Thailand versus Spain: the countries have comparable emissions levels, but Spain's larger GDP allows it to rank more favorably. An improvement for Thailand as compared to attribution by debt exists in its improved ranking (8 versus 4) when PPP-adjusted GDP attribution is applied.

The examples above demonstrate attribution of production emissions. However, the same logic can apply to attribution of consumption emissions – only that the total Absolute Emissions will account for domestic and imported sources of emissions that ultimately contribute to the GDP of the respective sovereign.

PCAF admits that there is not a 1:1 relationship between a financial institution's investment and a sovereign's GDP, in contrast to a more straightforward relationship between a financial institution's

purchase of a share of a sovereign's outstanding debt. However, empirical evidence suggests that there is limited interdependence between sovereign debt and emissions, whereas a country output production is linked more closely to the generated emissions. Furthermore, financial institutions' funds would typically spur economic growth and, therefore GDP[229], implying impact on production processes and therefore emissions.

While some concerns have been raised regarding the use of PPP-adjusted GDP—particularly the mismatch between numerator and denominator, where a financial institution's exposure (a stock value) is divided by GDP (a flow), the PCAF working group has consciously accepted this limitation in the absence of a more appropriate metric. The PPP adjustment was introduced not to reconcile the units of measurement but to ensure a fairer comparison of economic size across countries. This approach has received support during public consultations and was deemed to provide greater methodological consistency with other PCAF asset classes and international accounting practices.

PCAF also wishes to uphold consistency in all its guidance and align its methodologies with global frameworks In this respect, the selected approach of using PPP-adjusted GDP as the denominator for the sovereign debt asset class is in line with the EU Sustainable Finance Disclosure Regulation (SFDR, page 41), which proposes total scope 1+2+3 emissions divided by GDP. Therefore, using PPP-adjusted GDP as the denominator would also help to stimulate global standardization and alignment of GHG accounting practices for the Financial Sector that the PCAF Standard is aiming to achieve.

Therefore, financial institutions shall use the attribution by PPP-adjusted GDP for sovereign debt emissions.

PPP-Adjusted GDP for Sub-Sovereign Emission Attributions

As outlined in the sovereign debt chapter, the PPP-adjusted GDP reflects the real sizes of the economies and the output by subtracting the exchange rate effect. This effect becomes relevant for countries with a relatively strong exchange rate and allows for a fairer treatment of those countries. However, in contrast to countries, PPP-adjusted GDP for sub-sovereign territories is not readily available.

Due to the absence of PPP-adjusted GDP for sub-sovereign territories, the PPP-adjustment factor of the country **shall** be applied to the sub-sovereign GDPs within the respective country. The PPP-adjustment factor is derived by dividing PPP-adjusted GDP of a country by the unadjusted GDP of this country:

$$PPP - adjustment\ factor_c = \frac{PPP - adjusted\ GDP_c\ (current\ international\ \$)}{GDP_c\ (current\ US\$)}$$

(With c = Country)

In a second step, the PPP-adjustment factor can then be applied to the GDP of the sub-sovereign (e.g. region) to estimate PPP-adjusted GDP of this sub-sovereign:

[229] Admittedly, this relationship is valid up to a certain threshold because very large public debt might become unsustainable and detrimental for growth. See The impact of high and growing government debt on economic growth: an empirical investigation for the euro area (europa.eu).

$$PPP - adjusted\ GDP_s = PPP - adjustment\ factor \times GDP_s$$

(With s = Sub-sovereign)

This approach does not reflect differing price levels in regions and cities within a country. However, in most cases, price-level differences within a country should be lower than between countries. More so, PPP conversion rates are the rates of currency conversion that try to equalize the purchasing power of different currencies. Hence, applying these rates to regions with the same currency seems reasonable. Investing in sub-sovereign portfolios across different countries is a commonplace practice for investors.

Example: State of Bavaria, Germany

Step 1: Derive PPP-adjustment factor for Germany based on GDP and PPP-Adjusted GDP of Germany

GDP Germany 2022 (in mn US$)	PPP-Adjusted GDP Germany 2022 (in mn current international $)	PPP-adjustment Factor
4,082,469	5,582,288	1.367

(source: World Bank Database[230])

Step 2: Apply PPP-adjustment factor to GDP of Bavaria (source: Eurostat, Regional gross domestic product by NUTS 2 regions - million EUR)

GDP Bavaria 2022 (in mn US$)	PPP-adjustment Factor	PPP-Adjusted GDP Bavaria 2022 (in mn current int. $)
765,644	1.367	1,046,926

LIST OF DATA SOURCES – SOVEREIGN DEBT

PCAF has identified the following data required for accounting sovereign debt emissions and provides a list of public data sources with the most current and comprehensive data coverage per data category. However, this list is not exhaustive, and financial institutions might prefer to use other data providers. Independently of the data used, PCAF recommends aligning with the definitions of the data categories and being aware of the possible data specifics indicated earlier (e.g., GHG versus CO_2 emissions, inclusion or exclusion of land use (LULUCF) emissions in a country's production emissions).

Table 10.3-4. Overview required data and potential sources

Data category	Description	Source	Scope	Limitations
Scope 1 - Absolute emissions	Domestic Emissions (UNFCCC) Including LULUCF / Excluding LULUCF	UNFCC | Annex I countries and Non-Annex I countries (https://di.unfccc.int)	GHG and CO_2e emissions, global country coverage	No data available for the following non-Annex 1 parties: Andorra, Equatorial Guinea, Libya, Sierra Leone, Somalia.
		World | Total including LUCF | Greenhouse Gas (GHG) Emissions | Climate Watch (climatewatchdata. org)	Global coverage (CO_2)	CO_2 emissions only Most recent GHG emissions data available in 2018

[230] World Bank updates its database annually and changes historic data retrospectively.

		EDGAR - The Emissions Database for Global Atmospheric Research (europa.eu)	Global coverage (GHG)	Time-lag of 4 years (GHG emissions 1970-2018 series)
	Emissions of Exports of Goods and Services	OECD – Carbon dioxide emissions embodied in international trade (2021 ed.) (https://stats.oecd.org)	Global coverage (CO_2)	CO_2 emissions only Time- and data lags regarding non-Annex I countries
Scope 2 – Absolute emissions	Grid-supplied electricity, steam and cooling imports	OECD – Carbon dioxide emissions embodied in international trade (2021 ed.) (https://stats.oecd.org)	Global coverage (CO_2)	CO2 emissions only Industry code: D35 Electricity, gas, steam, and air conditioning supply is defined broader as scope 2 definition Time-lag of 4 years (CO_2 emissions 1995-2018 series) Data unavailable for some specific countries (e.g. Cuba, Egypt, Sierra Leone)
Scope 3 - Absolute emissions	Non-energy imports	OECD – Carbon dioxide emissions embodied in international trade (2021 ed.) (https://stats.oecd.org)	Global coverage (CO_2)	CO_2 emissions only Time-lag of 4 years (CO_2 emissions 1995-2018 series) Data unavailable for some specific countries (e.g. Cuba, Egypt, Sierra Leone)
PPP-adjusted GDP	GDP adjusted by PPP	GDP, PPP (current international $) | Data (worldbank.org)	Global coverage, 2020 data	Data unavailable for some specific countries (i.e. Cuba, Eritrea, Monaco)
Nominal GDP, Population	Standard macro-economic metrics	World Bank/ International Monetary Fund (IMF) (worldbank.org), (www.imf.org)	Global coverage, 2020 data	

LIST OF DATA SOURCES – SUB-SOVEREIGN DEBT

PCAF has identified the following data required for accounting -sub sovereign debt emissions and provides a list of public data sources with the most current and comprehensive data coverage per data category. However, this list is not exhaustive, and financial institutions might prefer to use other data providers for countries and regions that are not explicitly included below. Independent of the data used, PCAF recommends aligning with the definitions of the data categories and being aware of the possible data specifics indicated earlier (e.g., GHG versus CO_2 emissions, inclusion or exclusion of land use (LULUCF) emissions in a country's production emissions).

PCAF acknowledges that certain regions (e.g. emerging markets) are not covered in the table below yet, but additional data sources will be reviewed (e.g. data quality, licensing issues) and added in the future to this table. Subsequent updates will prioritize enhancing data coverage across several dimensions, including

the use of proxies for sub-sovereign data (e.g., scaling emissions from administrative levels above or below the underlying jurisdiction), expanding scope coverage to include scope 2 and scope 3 emissions, and integrating LULUCF data.

Table 10.3-5. Overview of potential data sources

Data Category	Description	Source	Scope	Limitations
Scope 1 – Absolute emissions	Domestic Emissions incl./excl. LULUCF **US**	Greenhouse Gas Inventory Data Explorer | US EPA	2022 data by state	
	Domestic Emissions excl. LULUCF **European Union**	EDGAR - The Emissions Database for Global Atmospheric Research (europa.eu)	2022 data by NUTS 2 level	No LULUCF data available
	Domestic Emissions incl./excl. LULUCF **Canada**	Canada's Official Greenhouse Gas Inventory - Environment and Climate Change Canada Data	2022 data by provinces and territories	
	Domestic Emissions incl./excl. LULUCF **Australia**	Emissions by state and territory | ANGA (climatechange.gov.au)	2022 by state and territory	
Regional GDP	Standard macro-economic metrics **US**	GDP by State | U.S. Bureau of Economic Analysis (BEA)	2023 data by state	
	Standard macro-economic metrics **EU**	Statistics | Eurostat (europa.eu)	2023 data by NUTS 2 level	
	Standard macro-economic metrics **Canada**	Add/Remove data - Gross domestic product, expenditure-based, provincial and territorial, annual (statcan.gc.ca)	2022 by provinces and territories	
	Standard macro-economic metrics **Australia**	Australian National Accounts: State Accounts, 2022-23 financial year | Australian Bureau of Statistics (abs.gov.au)	2023 by state and territory	

PPP-adjusted GDP	GDP adjusted by PPP	GDP, PPP (current international $) | Data (worldbank.org)	Global coverage, 2023 data	Data unavailable for some specific countries
Nominal GDP	Standard macro-economic metrics	World Bank/ International Monetary Fund (IMF) (worldbank.org), (www.imf.org)	Global coverage, 2023 data	

The GLOBAL GHG ACCOUNTING & REPORTING Standard

PART A

Website:
carbonaccountingfinancials.com
E-mail:
info@carbonaccountingfinancials.com

PCAF®
Partnership for Carbon Accounting Financials