Harmonizing and implementing a carbon accounting approach for the financial sector in North America

PCAF
Partnership for
Carbon Accounting
Financials

PCAF North America Core Team Members:

Ivan Frishberg, First Vice President, Sustainability Banking
William Peterson, Chief Credit Officer

Erin Kilmer Neel, Executive Director + Chief Impact Officer
Maria Kei Oldiges, Social and Environmental Impact Analyst

Keith Bisson, President

Jason Kolberg, Director of Enterprise Risk Management and Data Management
Paul Herendeen, Director of Impact Market Development

Melissa Malkin-Weber, Sustainability Coordinator

Jo Westwood, Impact Metrics Manager
Wesley Phillips, Sr. Analyst Insights – Impact Metrics

Simeon Chapin, Community Impact Officer

PCAF North America Sounding Board members:

Ben Janzen, Values Integration Director, Kindred Credit Union
Ryan Bjorkquist, Director, Environmental and Social Risk, MUFG Union Bank N.A.

Please cite as:

This report was commissioned by PCAF North America and compiled, edited, and reviewed by Navigant
Main authors at Navigant: Giel Linthorst, Mark van Eeghen, Nicole Labutong, and Noah Goldstein
October 2019

Table of **Contents**

Executive Summary

Partnership for Carbon Accounting Financials North America (PCAF NA) aims to lead and inspire other financial institutions, measure what matters, drive loans and investments, and meet goals to reduce greenhouse gas (GHG) emissions. GHG emissions accounting (or carbon accounting) is the cornerstone of responsible corporate climate activity. Measuring the GHG emissions of loans and investments enables a financial institution to improve risk management, identify opportunities associated with its GHG impact, and address stakeholders' needs on transparency and climate change. There is no established methodology in North America to accurately account for the GHG emissions from a financial institution's lending and investment activities (scope 3 emissions). These loans and investments make up the majority of a financial institutions' emissions impact and subsequently these organizations' contribution to global climate change.

In the Netherlands, fourteen financial institutions started the Partnership for Carbon Accounting Financials (PCAF Netherlands) in 2015, just prior to the Paris Climate Summit (COP21), and agreed to jointly develop open-source methodologies to measure the GHG emissions of their loans and investments. By measuring and disclosing this information they expect to develop more effective strategies that help contribute to a low carbon society in the hope that other institutions will follow suit.

The carbon accounting methodology developed in this report is the first iteration of a North America-focused approach. This report builds on the PCAF Netherlands approach and tailors it to the US and Canada, which differ in terminology, data availability, and the types of loan and investment activities. It is created by and for financial institutions that aim to lead and inspire other financial institutions.

PCAF NA developed methodologies to calculate the GHG emissions of loans and investments in six asset classes. Per asset class, the methodology uses publicly available data sources and emission factors to estimate the GHG emissions associated to a financial institution's portfolio. Data used are as specific as possible (e.g., based on geographic location and characteristics of the asset) and sector averages are used to fill gaps. Per asset class, a data quality score from 1 to 5 is applied to identify data quality improvement and enable financial institutions to improve data over time.

Table 1 provides an overview of the balance sheet items included in each asset class.

Table 1. Covered Asset Classes

Asset Class	Scope
Residential Mortgages	Any lending used to purchase residential property including multifamily properties between two and four units (properties with over four units are classified as commercial real estate [CRE]). Lending secured by homes where the funds are used for any purpose other than purchasing that property are to be considered consumer loans.
Commercial Real Estate	On-balance-sheet term loans for the purchase, construction, or rehabilitation of CRE, including multifamily residential properties made up of five or more units (properties with four or fewer units are classified under the residential mortgages asset class). Loans secured by CRE for other purposes, such as lines of credit, are classified under business loans.

Business Loans	Business loans include on-balance sheet term loans and lines of credit to businesses, non-profits, and any other structure of organization for any purpose other than development/ acquisition/rehabilitation of CRE. Business loans secured by real estate, such as CRE-secured lines of credit, are also included in the business loans asset class.
Listed Equity	This asset class includes all listed equity on the balance sheet and under management of the financial institution. These include: • Common stock • Preferred stock • Treasury stock • Exchange traded funds • Futures and forwards • Commodities • Fund of Funds
Energy Finance	On-balance-sheet project finance loans for the purpose of constructing, acquiring, or refinancing renewable and non-renewable energy producing plants. This category also includes project finance loans for energy efficiency improvements.
Motor Vehicle Loans	This asset class includes the following consumer Motor Vehicle types in a bank's loan portfolio: 1. Passenger car and passenger light truck 2. Motorcycles and scooters 3. Snowmobiles/all-terrain vehicles (ATVs) 4. Boats, including marine spark ignition engines This asset class also includes the following motor vehicles; however, PCAF did not find reliable emissions data for these: 1. RVs/motorhomes This asset class does not include: 1. Mobile homes (stationary) 2. Commercial vehicles such as buses, heavy duty trucks, or marine compression ignition

The authors of this report are part of the first wave of financial institutions in North America to quantify the GHG emissions associated with their loans and investments. The formulas and data sources are based on the loans and investment portfolios of its authors. The report will be expanded upon and refined as more financial institutions join the initiative.

1. Introduction

1.1 Purpose and Scope

The Partnership for Carbon Accounting Financials (PCAF) is an initiative created by and for financial institutions. It aims to enable the financial sector to align its loans and investment activities with the goals of the Paris Agreement.[1] Loans and investments make up most of a financial institution's greenhouse gas (GHG) footprint. However, there is no comprehensive global methodology to accurately account for the emissions associated with the diversity of assets in which financial institutions can lend or invest.

Climate change is driven by atmospheric GHG emissions. Therefore, GHG or carbon accounting is the cornerstone to measuring an organization's climate activity. As presented in Figure 1, an account of a firm or institutions' GHG emissions impact enables critical activities. Without a metric to quantify impact, all other activities are merely conjecture. Target setting assumes an organization can measure its emissions so that it can subsequently reduce its emissions in line with climate science. Likewise, climate action and reporting are only meaningful with a quantifiable measure of GHG emissions. The GHG impact of financial institutions' loans and investments are under their indirect control (i.e., they do not own or have operational control over them per the GHG Protocol, as described in Section 2.1). Though they are considered indirect emissions, financial institutions can still influence their loans and investments and make informed decisions on their emissions impact.

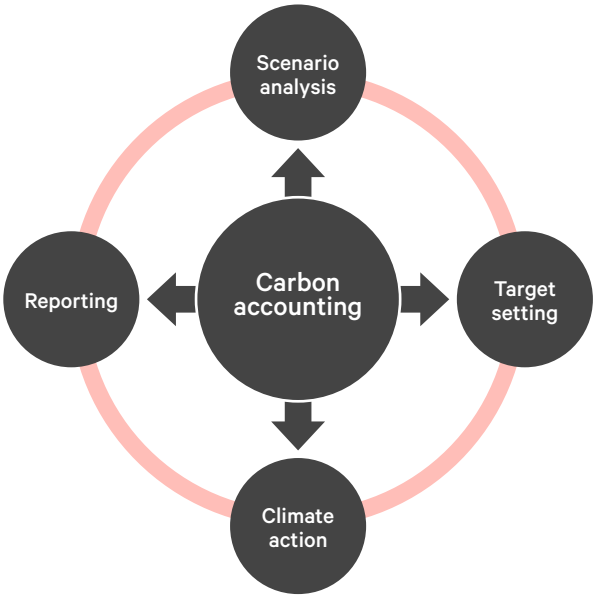


Figure 1. Carbon Accounting Is the Foundation for Alignment with the Paris Agreement and Other Global Initiatives

With a methodology to quantify GHG emissions, a financial institution can begin to manage risk and identify opportunities associated with its GHG emissions impact and to address the needs of myriad stakeholders such as borrowers, non-profits, NGOs, shareholders, and rating agencies. Moreover, since this is the first step in quantifying investor actions that shift capital toward a low carbon economy, the most important stakeholder is the global community.

PCAF members support the ultimate objective that financial institutions should use their influence to accelerate the transition to a low carbon economy. This can be accomplished through new financial products and services, asset allocation, and active ownership.

[1] United Nations Climate Change, "The Paris Agreement: Essential Elements," The Paris Agreement, https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.

1.2 The Partnership for Carbon Accounting Financials Approach

The PCAF approach was first launched in 2015 at the Paris Climate Summit (COP 21) by fourteen Dutch financial institutions with the aim of achieving transparency and uniformity in carbon accounting and target setting.[2] To achieve their goal, the institutions set out to develop a transparent, open-source methodology that would quantify the GHG emissions associated with their loans and investments. Since 2015, PCAF Netherlands (PCAF NL)[3] has grown to 18 Dutch financial institutions. They published the second and most recent version of the PCAF NL methodology at the end of 2018.[4]

These efforts inspired financial institutions in the US and Canada to develop a methodology for North America in January 2019. This report is the first iteration of that methodology. PCAF North America (PCAF NA) builds upon and tailors the PCAF NL methodology to the context of the US and Canada, which differ in terminology, data availability, and the types of loan and investment activities specific to its authors.[5]

Shortly after PCAF North America was launched, 28 members of the Global Alliance for Banking on Values (GABV) committed to a concerted, global effort among banking institutions to track and monitor the GHG impact of its portfolio of loans and investments within a period of 3 years, and ultimately ensure alignment with the Paris Agreement.[6] This commitment of GABV banks triggered a globalization of PCAF, which was launched on 23rd of September 2019.

1.3 PCAF North America

PCAF NA expands upon the work done to date by PCAF NL and tailors it to a North American audience. While its mission and objectives are specific to the authors of this report, they align with global efforts.

1.3.1 Mission and Objectives

PCAF North America aims to lead and inspire other financial institutions, measure what matters, drive loans and investments, and meet goals to reduce GHG emissions.

To achieve this, PCAF NA will develop a common set of approaches that can be used to measure the GHG emissions of different asset classes. The authors of this report are part of the first wave of financial institutions in North America to quantify the GHG emissions associated with their loans and investments. As with the PCAF NL methodology, the formulas and data sources are based on the loans and investment portfolios of its authors. The report will be expanded upon and refined as more financial institutions join the initiative. For a mapping of asset classes covered by PCAF NL and PCAF NA see Figure 2.

[2] Central banks, retail/commercial banks, internet banks, credit unions, savings and loan associations, investment banks, brokerage firms, insurance companies, and mortgage companies

[3] Platform Carbon Accounting Financials, "Developing Carbon Accounting Methodology for the Financial Sector," PCAF, http://carbonaccountingfinancials.com/.

[4] Global Alliance for Banking on Values, "Global Banking Leaders Commit to Align Their Carbon Footprint with Paris Agreement," GABV, http://www.gabv.org/news/global-banking-leaders-commit-to-align-their-carbon-footprint-with-paris-agreement.

[5] Since the contributing authors are banks in the US and Canada, the methodology only considers data sources from these countries. However, the methodology will be expanded in the future and may include representatives from other North American countries should they choose to participate.

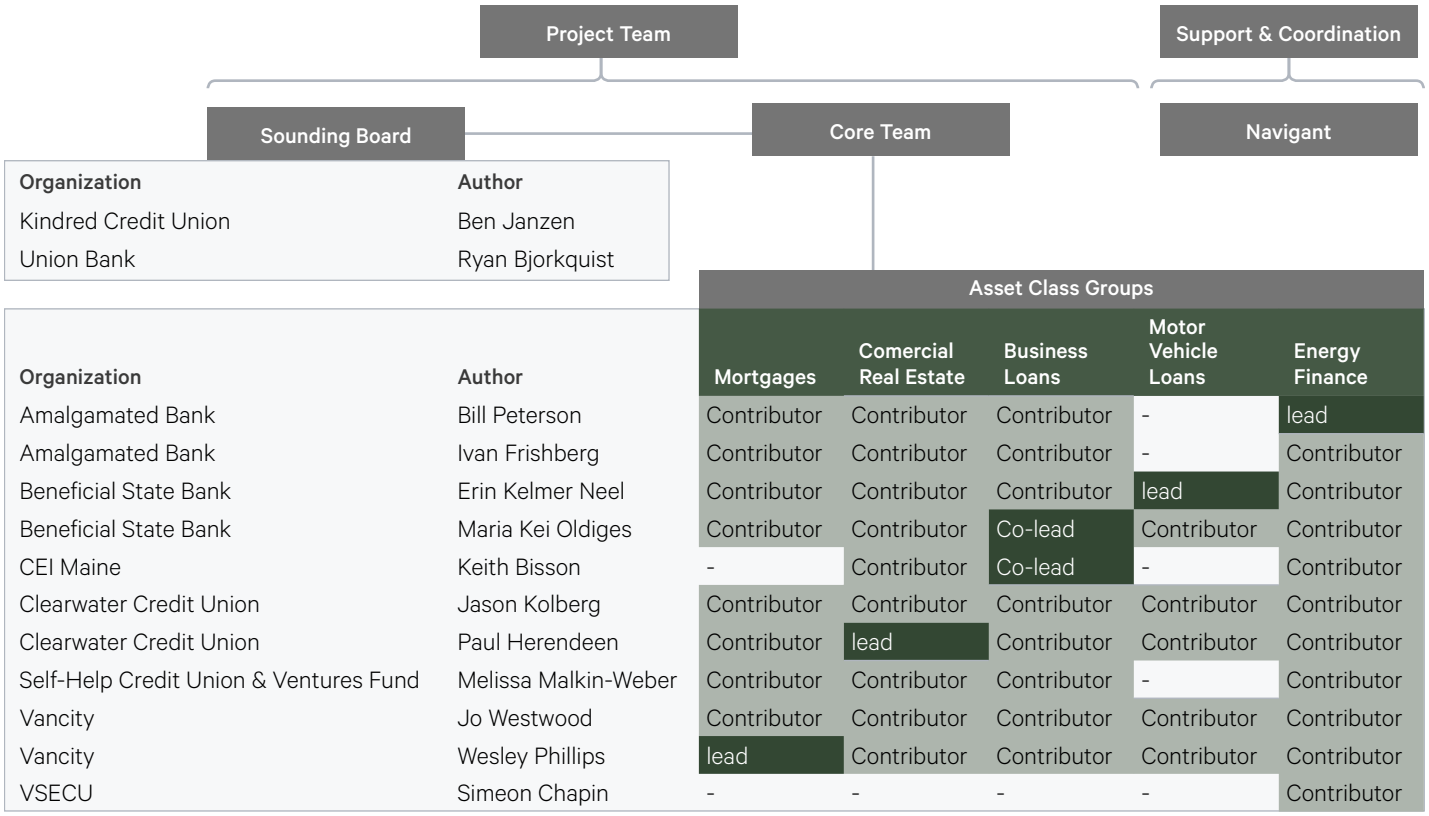
[6] Global Alliance for Banking on Values, "Global Banking Leaders Commit to Align Their Carbon Footprint with Paris Agreement," GABV, http://www.gabv.org/news/global-banking-leaders-commit-to-align-their-carbon-footprint-with-paris-agreement

PCAF Netherlands	PCAF North America
Mortgages →	Mortgages
Commercial Real Estate →	Commercial Real Estate
Corporate/SME Loans →	Business Loans
Listed equity →	Listed equity
Project Finance →	Energy Finance
Sovereign Bonds	Motor Vehicle Loans *(new)*
Corporate Debt: Bonds	
Indirect Investments	

Figure 2. Map of Asset Classes Covered by PCAF Netherlands and PCAF North America

1.3.2 Governance

The PCAF NA project team consists of a core team and sounding board, as illustrated in Figure 3. Navigant provided facilitating and technical support as well as support to align efforts with PCAF NL (see Section 1.1, "Purpose and Scope")



Organization	Author
Kindred Credit Union	Ben Janzen
Union Bank	Ryan Bjorkquist

		Asset Class Groups				
Organization	Author	Mortgages	Comercial Real Estate	Business Loans	Motor Vehicle Loans	Energy Finance
Amalgamated Bank	Bill Peterson	Contributor	Contributor	Contributor	-	lead
Amalgamated Bank	Ivan Frishberg	Contributor	Contributor	Contributor	-	Contributor
Beneficial State Bank	Erin Kelmer Neel	Contributor	Contributor	Contributor	lead	Contributor
Beneficial State Bank	Maria Kei Oldiges	Contributor	Contributor	Co-lead	Contributor	Contributor
CEI Maine	Keith Bisson	-	Contributor	Co-lead	-	Contributor
Clearwater Credit Union	Jason Kolberg	Contributor	Contributor	Contributor	Contributor	Contributor
Clearwater Credit Union	Paul Herendeen	Contributor	lead	Contributor	Contributor	Contributor
Self-Help Credit Union & Ventures Fund	Melissa Malkin-Weber	Contributor	Contributor	Contributor	-	Contributor
Vancity	Jo Westwood	Contributor	Contributor	Contributor	Contributor	Contributor
Vancity	Wesley Phillips	lead	Contributor	Contributor	Contributor	Contributor
VSECU	Simeon Chapin	-	-	-	-	Contributor

Figure 3. PCAF NA Governance Structure

The core team served as the decision-making arm of the project and created the PCAF NA methodology with Navigant's support. Each organization within the core team contributed to or led the development of at least one asset class group methodology. Leads facilitated discussions, drafted the methodology, and created case studies. Contributors actively participated in discussions to develop the methodology.

Sounding board members were asked for input and feedback on the methodology at a few key points in its development. Their feedback was taken into consideration, but members did not have decision-making authority.

2. Technical Report

2.1 Standards and Overarching Principles for Methodology Development

2.1.1 Greenhouse Gas Protocol Corporate Standard

Emissions Scopes

This methodology goes beyond balance sheet accounting by quantifying a financial institution's assets by its associated GHG emissions. The GHG accounting methodologies used in this report are in conformance with the GHG Protocol Corporate Standard.[7] The GHG Protocol is widely considered the leading standard for preparing a corporate-level GHG emissions inventory. It defines three distinct scopes that describe the level of control and activities of an organization's emissions (see Figure 4).

Emissions scopes:[8,9]

- Scope 1: Direct GHG emissions occur from sources that are owned or controlled by the organization.
- Scope 2: Indirect GHG emissions from the generation of purchased energy (electricity, steam, heat, and cooling) consumed by the organization.
- Scope 3: All other indirect emissions that are a consequence of the activities of the organization but occur from sources not owned or controlled by the organization. This scope consists of 15 different categories (see Figure 4).

In most sectors, scope 3 typically makes up most of an organization's GHG emissions impact. For financial institutions, most emissions are under scope 3, category 15 – investments (i.e., financed emissions). This report aims to define the methodologies to assess the GHG emissions that fall under this category.

Indirect emissions overlap with one another. An organization's scope 3 emissions are the scope 1 and 2 emissions of other organizations. And though scope 3 is not technically under an organization's direct control, there are still ways to manage those emissions and use other stakeholders in the value chain to synergize efforts and reduce emissions on multiple fronts.[10]

[7] Greenhouse Gas Protocol, "Corporate Standard," The Greenhouse Gas Protocol, https://ghgprotocol.org/corporate-standard.

[8] Greenhouse Gas Protocol, World Business Council for Sustainable Development, and World Resources Institute, A Corporate Accounting and Reporting Standard, 2004.

[9] Greenhouse Gas Protocol, "Scope 3 Calculation Guidance," Technical Guidance for Calculating Scope 3 Emissions, http://ghgprotocol.org/scope-3-technical-calculation-guidance.

[10] Science Based Targets Initiative, Navigant, Gold Standard, Value Change in the Value Chain: Best Practices in Scope 3 Greenhouse Gas Management, 2018, https://sciencebasedtargets.org/wp-content/uploads/2018/12/SBT_Value_Chain_Report-1.pdf.

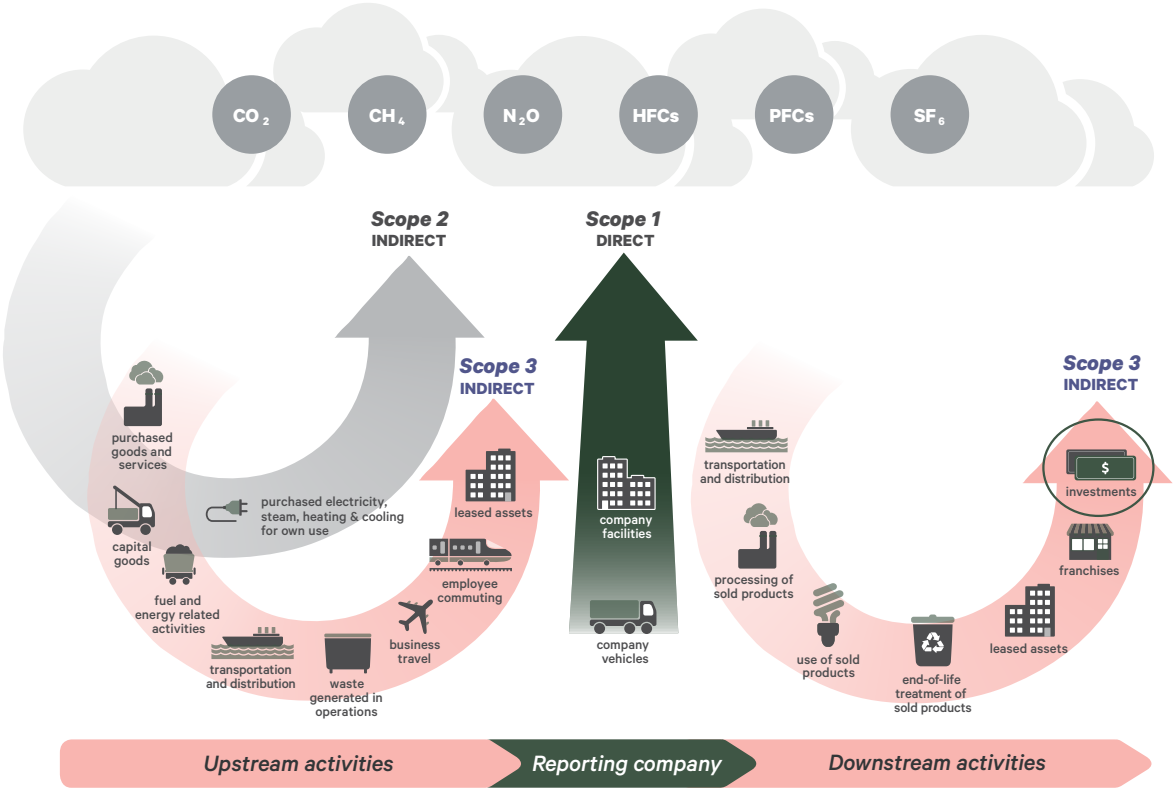


Figure 4. GHG Protocol Emissions Scopes.
Source: WRI and WBCSD (2011). The GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

How Scopes Are Referred to in This Methodology

Scopes are described from the perspective of the organization reporting its emissions. As noted, the scope 3 emissions of an organization are the scope 1 and 2 emissions of other organizations. In the asset class methodologies, the emissions scopes are described from the perspective of the borrower or investee, which may be a project, organization, or person.

2.1.2 Greenhouse Gas Accounting Principles

This section lists common sets of basic design and accounting principles for GHG accounting for financial institutions, regardless of the type of loan and investment. These principles will provide guidance on how to account for and report on a financial institution's GHG emissions. To distil a set of overarching principles, PCAF members rely on work already done on this topic. To define basic design and accounting principles, PCAF members made a practical selection from principles for GHG accounting that are already available and combined them with generally accepted accounting principles, described in the following sections.

Recognition

According to the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, the GHG emissions of any financial institution should include scope 1, 2, and 3 emissions. Avoided emissions can be accounted for as well, but should be done separately from scopes 1, 2, and 3.

Disclosure

Frequency:

- Financed emissions should be accounted for and reported at least annually (using either the calendar or fiscal year, as long as it is consistent).

Purpose:

- Ensure the GHG emissions impact appropriately reflects the GHG emissions of the financial institution and serves the decision-making needs of users—both internal and external.
- Meet the specific GHG emissions impact goals of the financial institution. For example, because the financial institution is working toward a specific GHG emissions impact target as an indicator of success for broader strategic goals.

Coverage:

- The completeness of the financial institution's GHG emissions impact; disclose and justify any specific exclusions.
- Coverage of asset classes; disclose if the footprint is cross-asset or only for the relevant asset classes.
- Coverage of the assets that are included; disclose the percentage of the assets included in the GHG emissions impact per asset class, preferably all assets per asset class but at least the majority.

Transparency:

- Assumptions: Disclose any relevant assumptions and make appropriate references to the accounting methodologies and data sources used.
- Metrics: Disclose the financial institution's absolute or relative (intensity) emissions plus an explanation of their difference. For maximum transparency, it is best practice to disclose both on an absolute and intensity basis.
- Recalculations: Recalculate the financial institution's previous reports using the most recent, most relevant, or most accurate data to make a more reliable comparison between the current report and previous years. The recalculation steps should be transparent.
- Reporting: Provide a simple, precise description of scope 1 (direct), 2, and 3 (indirect).
- Prudence: Show scope 1, 2, and 3 separately to ensure comparability, avoid understating financed emissions, and provide transparency on potential areas of double counting (see section below on Double counting).

Measurement

Gases and units:

- The seven GHGs listed in the Kyoto protocol are measured: CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). These seven gases can be expressed in CO_2 equivalents (CO_2e). Various conversion factors to CO_2e exist and reporting institutions should make clear which factors they use.[11]
- Absolute emissions are expressed in metric tonnes[12] of CO_2e (tCO_2e): While it is understandable that many North American emissions calculations may be presented in other units, converting to metric units is a necessity.
- Relative emissions are expressed in metric tonnes of CO_2e per $1 million (US or Canadian) invested: tCO_2e/$ million.

Attribution:

- "Follow the money" is a key principle for GHG accounting of financial assets, i.e., the money should be followed as far as possible to understand and account for the GHG emissions impact in the real economy.[13]
- In principle, scope 1, 2, and relevant categories of scope 3 of the borrower or investee should be included in the GHG emissions impact. When deviating from this, it should be made clear why.
- Influence of the financial institutions on steering the investment. If the influence is bigger, the proportional share for accounting the footprint to the investment is larger.
- The denominator, i.e., the financial value of the asset that (in relation to the investment) determines the proportional share for accounting the GHG emissions impact and should include all financial flows (i.e., equity and debt) to the borrower or investee. When deviating from this, it should be made clear why.

[11] As a baseline, Platform for Carbon Accounting Financials North America (PCAF NA) suggests using 100-year global warming potentials from the most recent Intergovernmental Panel on Climate Change (IPCC) Assessment Report.

[12] One metric tonne = 1 mg

[13] This principle is applied differently to Business Loans. Please see section 2.5 of this report for further details.

These overarching principles were applied consistently to design and agree upon the GHG accounting methodology per asset class.

Greenhouse Gas Accounting Limitations

Double Counting

In this report, double counting occurs when GHG emissions or emissions reductions are counted more than once toward attaining mitigation pledges or financial pledges for the purpose of mitigating climate change.
Apart from the double counting that intrinsically occurs between the different scopes, double counting can take place at five levels:

1. Between financial institutions
2. Co-financing of the same entity or activity
3. Between transactions within the same financial institutions
4. Across different asset classes
5. Within the same asset class

PCAF recognizes that double counting of GHG emissions cannot be avoided completely, but it should be avoided as much as possible. Double counting between co-financing institutions, and between transactions within the same asset class of a financial institution, may be avoided by appropriate attribution.

Flow versus Stock

When measuring GHG emissions, PCAF NA uses a flow variable to assess how much GHG is emitted over a specific period, typically during a calendar or fiscal year. The finances are in flow. However, when PCAF NA determines the borrower's and investor's contribution to these emissions, PCAF NA considers their portfolio at a specific point in time i.e., it is the stock. This can be misleading since seasonal variations may show that the emissions are higher or lower at a given time compared to the year as a whole. While making measurements at the same time every year (e.g., December 31) does provide some year on year consistency, the seasonal trends are reflected annually.
For example, if an investor owns 100% of organization X during the entire year but sells all their shares on December 30. The calculation on December 31 would not show the shares of organization X anymore and the influence the investor exerted on the organization during the year is not expressed correctly in the GHG emissions impact.
A solution to this issue could be to include the number of days in the attribution factor, as in the example above a factor of 364/365. This would provide a more balanced opinion about the investor's contribution. However, as this is more data-intensive and complex, PCAF NA decided not to include this in this version of the report.

2.1.3 Data Quality Principles

An important element of GHG accounting is the availability of high quality data on emissions of loans and investments. Different asset classes present challenges and opportunities with respect to emissions data. This section gives a few overarching principles on the quality and desired hierarchy of emissions data, with more detailed guidance provided in each asset class section.
High quality emissions data are defined as follows:

- Emissions data are consistent, both across entities and time
- Emissions data reflects the underlying emissions generating activities of the entity, and are not impacted by unrelated factors
- Emissions data are accompanied by some form of assurance

It is unlikely that emissions data meet all the criteria listed, and that is why a data quality scoring is used. Per asset class, a data quality scoring from 1 to 5 is applied to identify data quality improvement and enable financial institutions to improve data over time. Reference Figure 5 for the data hierarchy used in this report.

2.2 Asset Class Methodology Overview

2.2.1 Asset Class Methodology Report Structure

All asset classes use the structure presented in Table 2, both for clarity and to enable a direct comparison between asset classes.

Table 2. Asset Class Table Structure

Topic	Description
Asset class definition	Characterization of what is and is not considered part of the asset class
Scopes covered	GHG emissions scopes included in the methodology
Portfolio coverage	Percentage or aspects of the portfolio within the methodology boundaries
Attribution	How the share of total GHG emissions of the borrower or investee are attributed to the loan or investments
Data	Relevant data sources that can be used in the calculation and what needs to be considered when selecting a data source (see Figure 5)
Absolute versus relative emissions	Basis upon which the emissions are calculated
Avoided emissions	Description of how avoided emissions are accounted for
Other considerations	Additional considerations or recommendations not included above
Limitations	Extent to which the methodology can be applied
Calculation examples	Step-by-step application of the methodology using sample data intended to help the reader gain a more thorough understanding of barriers that might arise and how to address them[14]
Regional alignment	Notable differences between PCAF NA and PCAF NL

Data Hierarchy

Each asset class methodology provides a numbered hierarchy to illustrate which data sources to apply based on data availability. The score of any calculated emission is that of the lowest-quality scoring element of the calculation (e.g., an emission calculated using a Score 3 and a Score 5 data point will be considered a Score 5).

Data used in PCAF NA are assigned a score based on its specificity and accuracy, which is further detailed per asset class.

[14] There are multiple ways to use a financial institution's data and the public data on emissions of loans and investments to derive GHG emissions impact while adhering to the general principles and methodologies described in this report. Each example is meant to illustrate one practical way to apply the methodology and address common challenges in doing so.

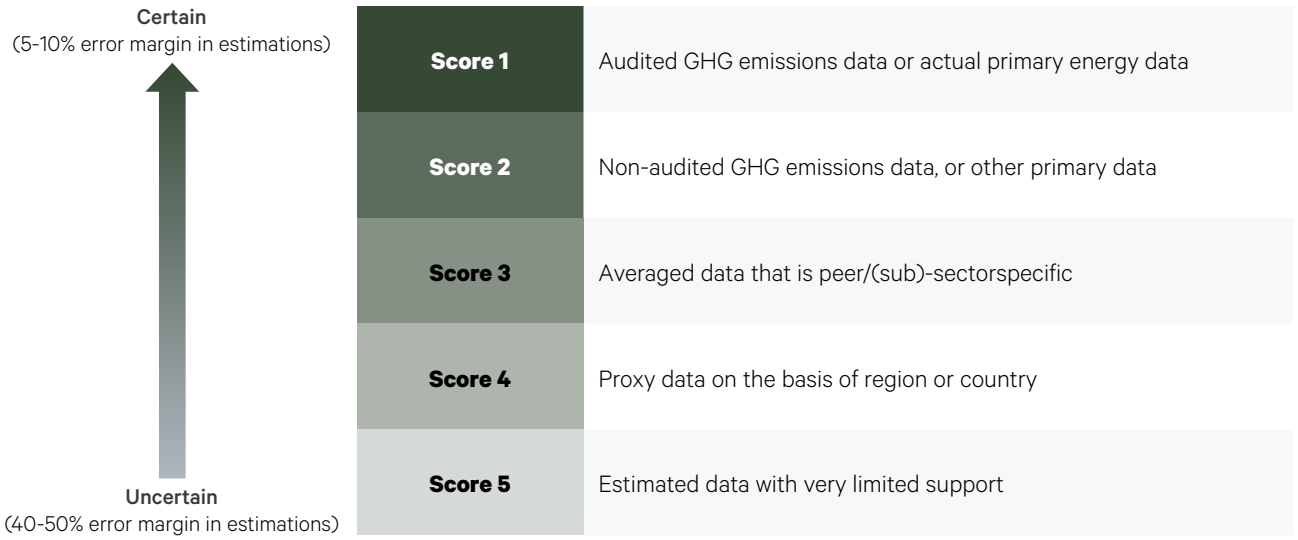


Figure 5. Data Quality Scoring

2.2.2 Asset Classes Covered by PCAF North America

The asset classes in PCAF NA were chosen based on their relevance to the authors' portfolios. In future versions of the report, the methodology will be extended to other asset classes not identified in Table 3. The boundaries of each asset class were drawn to minimize double counting of emissions and to promote consistency per the principles described in 2.1.

Table 3. Asset Class Definitions

Asset Class	PCAF NA definition
Residential Mortgages	Any lending used to purchase residential property, including multifamily properties between two and four units (properties with over four units are classified as commercial real estate (CRE)). **Loans secured by homes where the funds are used for any purpose other than purchasing that property are to be considered consumer loans.**
Commercial Real Estate (CRE)	On-balance-sheet term loans for the purchase, construction, or rehabilitation of CRE, including multifamily residential properties made up of five or more units (properties with four or fewer units are classified under the residential mortgages asset class). Loans secured by CRE for other purposes, such as lines of credit, are classified under business loans.[15]
Business Loans	Business loans includes on-balance sheet term loans and lines of credit to businesses, nonprofits, and any other structure of organization for any purpose other than development/acquisition/rehabilitation of CRE. Business loans secured by real estate, such as CRE-secured lines of credit, are also included in the business loans asset class organization.
Listed Equity	This asset class includes all listed equity on the balance sheet or under management of the financial institution. These include common stock, preferred stock, treasury stock, exchange traded funds, futures and forwards, commodities, and fund of funds.

[15] US Energy Information Administration, "About the Commercial Buildings Energy Consumption Survey," Consumption & Efficiency Commercial Buildings Energy Consumption Survey, https://www.eia.gov/consumption/commercial/about.php.

Energy Finance	On-balance-sheet project finance loans for the purpose of constructing, acquiring, or refinancing renewable and non-renewable energy producing plants. This category also includes project finance loans for energy efficiency improvements.
Motor Vehicle Loans	On-balance-sheet term loans for consumer vehicles including passenger cars, passenger light trucks, motorcycles and scooters, snowmobiles, boats, and motorhomes.

2.2.3 Common Features between Asset Classes

Table 4 summarizes commonalities between multiple asset classes such as scopes covered, portfolio coverage, attribution, and data. This table does not summarize unique features for each asset class; those features are described in subsequent asset class sections.

Table 4. Commonalities Between Asset Classes

Topic	Applicable Asset Classes	Description
Scopes Covered	Mortgages, CRE, business loans, listed equity and motor vehicle loans.	Scope 1, scope 2, and—if relevant—scope 3 (of the borrowers) are covered.
Portfolio Coverage	All	100% of the on-balance sheet portfolio is covered. If full coverage is not possible, provide a reason why full coverage was not possible.
Attribution	All	100% of emissions The attribution will be allocated between the individual providers of debt, equity, or mezzanine debt, depending on the specific capitalization of the business or project.
Data	All	All data sources referenced are public, are as specific as possible, and scored according to a specific data quality scoring.
Other Considerations	Mortgages, CRE, business loans	Methodology users may wish to apply a modifier (i.e., assume emissions are lower for a subset of borrowers) based on a factor that cannot be specifically quantified. This would entail multiplying total emissions by a multiplier that would lower the emissions for those companies or properties. For example, a financial organization may want to multiply emissions for those with an ENERGY STAR rating by 0.X and assume those organizations or individuals are applying (1-%X) greater energy efficiency measures than those without the certification.

2.2.4 Applying the Methodology

Incentivizing Behavior and Avoided Emissions

PCAF was created with the aim of enabling the financial sector to align its loans and investment activities with the goals of the Paris Agreement. This will involve systemically engaging with client to facilitate the transition and shifting capital toward low carbon products and services. By applying PCAF, financial institutions will be able to make informed decisions on how to invest their portfolio and create incentives to drive certain behaviors. PCAF enables to measure and disclose both the positive and negative climate impacts of loans and investments. Positive impact are often referred to as avoided emissions.

Avoided emissions are emissions reductions that occur outside of a product's life cycle or value chain (scopes 1, 2, and 3) because of the use of that product. In other words, these are the positive emissions impacts of a project compared to a situation where that product does not exist. In this report, avoided emissions are investments that lead to lower GHG emissions elsewhere in the economy (e.g., investing in renewable energy projects that result in avoiding the emissions from more carbon-intensive fuel sources when consumed). It should be noted that though there is no accounting standard for avoided emissions, PCAF recommends estimating them. Reference the World Resources Institute's working paper, Estimating and Reporting the Comparative Emissions Impacts of Products, for the latest best practices.[16]

Data and Calculations

Per the GHG Protocol Corporate Standard, organizations should use actual data when available and supplement it with estimated or averaged data to fill any gaps. When estimating data, financial institutions should always use the most specific level (i.e., pertaining to activity, location, or other characteristics that may show correlations with emissions impact). This will help provide the highest degree of accuracy in calculations.

In the asset class methodologies that follow, the sample calculations provide recommendations for publicly available data sources but are not entirely comprehensive. Those applying the methodology may substitute or supplement data found in this report with other reputable sources that are directly applicable to the parameters described in the following calculations. Financial institutions should always disclose data sources and use the most recent data available.

The calculations assume that the public data sources that were used to derive emissions align with the information the authors of this report have in their portfolios. When applying the methodology, it may be necessary to make some adjustments to the calculations provided to convert units or extrapolate to fill in missing data. Data quality may be improved over time by requesting or requiring information necessary for these calculations from borrowers.

[16] World Resources Institute, Estimating and Reporting the Comparative Emissions Impacts of Products, 2019, https://www.wri.org/publication/estimating-and-reporting-comparative-emissions-impacts-products#.

"The allocation of capital is one of the most powerful tools we have in addressing climate change and in determining the kind of future we want to create. The Partnership for Carbon Accounting Financials will be an important tool for financial institutions that are working to create a low carbon future."

Tamara Vrooman, President & CEO of Vancity

2.3 Residential Mortgages

Topic	Outcome
Asset Class Definition	Any lending used to purchase residential property, including multifamily properties between two and four units (properties with over four units are classified as CRE). Lending secured by homes where the funds are used for any purpose other than purchasing that property are to be considered consumer loans.
Scopes Covered	Energy use of financed buildings (scopes 1 and 2).
Portfolio Coverage	100% of on-balance-sheet mortgages used to purchase residential property which is held as security.
Attribution	As the financial institution is often the only provider of a mortgage to purchase property, it is proposed to fully attribute the emissions to the provider of that mortgage. Mortgages are one of the few asset classes where a financial institution can directly engage with its customers and take responsibility for a societal challenge. The characteristics of the financed properties can be considered in investment decisions regardless of the size of the mortgages. This version of PCAF does not take the loan-to-value into account. PCAF NA believes it is best for financial institutions to assume 100% of the home's emissions until it is feasible that individuals will take ownership of the emissions from the equity stake in their homes.

Data

The data availability on energy consumption of properties is limited in North America. PCAF NL has many benefits as a result of policies that have improved home emission reporting, such as their energy labels, which do not have a good equivalent in North America. As more data sources become available it is expected that institutions move up the data hierarchy, but easily accessible data for the US and Canada are currently between level 4 and 5 of the data quality hierarchy provided below.

In the US, the Energy Information Administration (EIA) provides average energy consumption data by housing type, square footage and geographic region. Some banks may not collect information on square footage, in which case they can use the average energy consumption by housing type and geographic region. In Canada, Natural Resources Canada (NRCAN) provides energy consumption information by housing type and vintage by province. Information from the Canadian Census may be used to extract building stock by province and census subdivision.

It is expected that institutions use the highest precision dataset possible and to evaluate new data sources on a regular basis.

Table 5: Data Quality Scoring for Residential Mortgages (based on available data)

Data Quality (Highest to Lowest)	Description
Score 1	Actual energy consumption, converted to CO_2e emissions using verified emission factors specific to the type of energy consumed.
Score 2	Actual energy consumption, converted to CO_2e emissions using emission factors for energy from undefined fuel source.
Score 3	Average, actual energy consumption per postal code regions, converted to CO_2e-emissions using general grid emission factors by specific geographic regions; or, Average energy consumption by home type (attached home, apartment, etc.) and square footage, converted to CO_2e emissions using emission factors for energy from undefined fuel source.
Score 4	Average energy consumption by home type, converted to CO_2e using general grid emission factors by state or province.
Score 5	Average energy consumption by home type, converted to CO_2e using general grid emission factors for the country.

Most financial institutions indicated that they currently collect information about geographic location and building type. PCAF NA suggests that financial institutions work with actual data on the energy consumption of properties, if available. The consumed gas and electricity at the household level can be converted to CO_2e-emissions using grid emission factors if there is no emissions data provided in the chosen data sources (as some data sources report only energy use whereas others report CO_2e emissions). As an intermediate step, financial institutions could start collecting building square footage, in addition to geographic location and building type, to more accurately capture the associated GHG emissions of their mortgages.

Absolute vs. Relative Emissions	The methodology results in absolute emissions per household, which can be aggregated as total emissions for the mortgage portfolio. This information can be further specified and translated into relative emissions to report the GHG emissions per dollar lent (CO_2e/$).
Avoided Emissions	A mortgage for retrofitting a home to become climate-positive, i.e., generating more energy than it consumes, should be considered as a part of the energy finance category. If the home in question has a traditional mortgage on the institution's books this would be reported as a modifier instead (see note on "green" homes in the table that follows).

Other Considerations

Obtaining data on energy consumption	Actual consumption data made anonymous but specific to a certain mortgage portfolio is preferred. The actual energy consumption will be more accurate than working with the average energy. If possible, financial institutions should attempt to obtain these actual data directly from grid operators. If actual consumption data are unavailable, financial institutions should start collecting building square footage in addition to geographic location and building type to more accurately capture the associated GHG emissions of their mortgages.
Off-balance mortgages and subsidiaries	The scope of this methodology is on-balance-sheet mortgages; off-balance-sheet mortgages are not required for reporting at this time. If relevant and substantial, off-balance sheet mortgages can be reported separately.
Distinguishing between private and corporate mortgage	No distinction is made between private or corporate mortgages, so long as they are between one and four units and are residential properties.
Note on "Green" Homes	The original Dutch PCAF group had the benefit of energy labels, which allow them to identify lending in their portfolio that had lower emissions. There is no equivalent in North America, so this report is intended to bridge that gap in another way, so institutions can have control over lowering their emissions before data quality is perfect. Most institutions in the working group have mortgages to homes that are "green." PCAF NA is still in the process of identifying how to deal with these loans but is inclined to report them with a modifier for groups of homes with the same certifications (say, 20% less emissions for ENERGY STAR 80 PLUS homes). These modifiers can be applied as needed by an institution and can go up to 100% (zero emissions); however, the evidence for the modifier must be explicitly reported. As an alternative, institutions can simply highlight their green programs in their written reporting and note their emissions may be lower as a result. In this case, they cannot alter their reported figures.
Home Equity Lines of Credit	Home equity lines of credit (HELOC) follow the same logic as any other lending. If they were used to purchase the home held as security they should be included, otherwise they are assumed to be consumer loans. Outstanding balance is used for the purposes of calculating relative emissions at this time; however, there is still room for improvement. Future work will include developing an approach to account for lines of credit given the HELOC's original purpose (or the reason why the client took out the line of credit in the first place) will most likely change over time.

Limitations

Result Dependent of Data Quality	Many assumptions must be made to calculate the emissions of mortgages as data are often difficult to retrieve due to privacy reasons. Even though the calculation method does not differ greatly, the data sources can yield different results, for instance, when average consumption data are replaced by actual consumption data coming from grid operators.
Attribution of Emissions	If actual consumption data are used, it is not clear if all the energy consumption is applicable solely for the house or for instance also for an electric car. The actual energy consumption data can be further refined by energy source.
Double Counting	As 100% of the emissions per mortgage is attributed to the mortgage provider, it is possible that in some cases, houses with mortgages at multiple providers will be double counted.

Calculation Example

Description of Example 1	This example is a simplified Canadian example using the available Natural Resources Canada (NRCAN) data for provincial home emissions.
Data Used	Mortgages should be separated out using intended use descriptions or something similar, which can identify collateral types and which loans were used to purchase homes (e.g., Vancity has a real estate purchase flag). The British Columbia-specific NRCAN data was also used, as follows: GHG totals for each home type: Detached, attached, apartment Housing Stock by type: Number of homes

Calculation and Results	Preparing the internal data is often the most complex part of this process and may take almost all the effort to run through a calculation. When a Canadian bank was creating a case study, finding and extracting the real estate purchase flags (or an equivalent) and connecting them to active mortgages required detailed database knowledge and proved to take the majority of data preparation time. The next task is to classify the internal collateral definitions into the three NRCAN categories (detached, attached, apartment), which is straightforward. Once this is set up the arithmetic is simple, as shown in the example that follows. High level data points and their subsequent use in the calculations for a Canadian bank located in British Columbia: 1. Number of homes in each category (detached, attached, apartment) that were used for the primary purpose of purchasing the property. 2. Number of homes in British Columbia in each category from NRCAN. 3. Total GHG emissions for each category from NRCAN. 4. Total real estate purchase lending on homes in each category. The calculation was as follows (for each of the three housing types): 1/2 x 3 = Total GHGs (Total GHGs) / 4 = Relative GHGs Data score = "4," as provincial data are used. As an example, say a small British Columbia-based credit union has a portfolio of 400 mortgages valued at $150 million. This indicates that they are all for the primary purpose of purchasing the underlying collateral. The number of single detached homes comes from NRCAN, which is 970,652 in British Columbia. These homes collectively release 2,675 KtCO_2e, which means that on average a single home in British Columbia contributes 2,675,000/970,652 = 2.76 tCO_2e per home. Portfolio's total tCO_2e = 2.76 x 400 = 1,102 tCO_2e Portfolio's relative tCO_2e = 1,102 / 150 = 73 tCO_2e/$ Million
Description of Example 2	An example of a small portfolio of mortgages in the California eGrid region of the US.
Data Used	Mortgages should be separated out using intended use descriptions or something similar, which can identify which loans were used to purchase homes and California-specific information from the following sources: • US EIA's summary annual household site consumption and expenditures in the US—totals and intensities, 2015. • Electric emission factors are from US Environmental Protection Agency's (EPA's) Emission Factors for GHG Inventories (2018). • Energy consumption by fuel type from the EIA. • Emission factors for natural gas and other fuel types from the EIA.

Calculation and Results	High level data points and their subsequent use in the calculations for a US bank in California: 1. Number of homes with lending used for purchasing the property. 2. Total energy in Btu consumed per household. 3. Percentage share of electricity, natural gas, and other fuel sources relative to the total energy consumption from the EIA. 4. Emission factors of electricity, natural gas, and other fuel sources in California 5. Total real estate purchase lending on homes in each category. The calculation is as follows (for each of the three housing types): 1 x 2 x 3 x 4 = Total GHGs (Total GHGs) / 5 = Relative GHGs Data score = "4," as state-level data are used. As an example, say a small California-based credit union has a portfolio of 700 mortgages valued at $450 million USD. They are all for the primary purpose of purchasing the underlying collateral and have confirmed they are all in the Pacific census division. The total home energy consumption of a home is determined from the EIA data which is 53.1 Million Btus in Pacific. Based on EIA data for annual household site fuel consumption, 52% of energy consumption is from electricity, and the remainder is from natural gas.[17] The total electricity consumption per household is 8.09 MWh and the total natural gas consumption is 25.5 MMBtu. Using the California eGrid emission factor of 454.1 lbs CO_2/MWh, and the natural gas emission factor of 116.8 lb CO_2/MMBtu, the total emissions of the portfolio are calculated to be: These homes' collective total tCO_2e = 700 x (8.09 x 454.1 + 25.5 x 116.8) = 4,656,448 lb CO_2e= 2,328.2 tCO_2e The portfolio's relative tCO_2e = 2,328.2 / 450 = 5.2 tCO_2e/$ million USD

Regional Alignment

The North American Working Group has chosen to include only mortgages used for purchasing a property. If the loan is for any other purpose, then it should be considered a consumer loan. There is currently no framework to account for consumer loans; however, it is generally accepted in the North American Working Group that this category will cover consumer purpose lending much like the business loan category.

[17] Household energy consumption by fuel type. Reference Pacific, https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce2.1.pdf.

"PCAF responds to the need that WRI has seen for a standardized approach to measure GHG emissions across portfolios. We expect this method to be extremely valuable to FIs in understanding their impact on the climate and in providing more transparency to stakeholders."

Cynthia Cummis, Director of Private Sector Climate Mitigation, Steering Committee Member of the Science Based Targets initiative at World Resources Institute

2.4 Commercial Real Estate (CRE)

Topic	Outcome
Asset Class Definition	On-balance-sheet term loans for the purchase, construction, or rehabilitation of CRE, including multifamily residential properties made up of five or more units (properties with four or fewer units are classified under the residential mortgages asset class). Loans secured by CRE for other purposes, such as lines of credit, are classified under business loans.
Scopes Covered	Energy use of financed buildings (scope 1 and 2).
Portfolio Coverage	100% of the on-balance finance to CRE.
Attribution	Equal to the ratio of the outstanding loan value at the time of GHG accounting to the total property cost at the time of loan origination.

Data

Direct measurements of building energy consumption are preferred but may not be widely available. In the absence of direct measurements, energy use can be estimated based on building characteristics and publicly available data. Similarly, verified emission factors for specific energy sources should be used if they are available. If they are not, standard grid/fuel emission factors may be used.

Based on the data available, the following data hierarchy is proposed, in order of preference:

Table 6. Data Quality Scoring for Energy Consumption

Data Quality (Highest to Lowest)	Description
Score 1	Actual energy consumption converted to CO_2e emissions using verified emission factors specific to the type of energy consumed.
Score 2	Actual energy consumption converted to CO_2e emissions using standard/average emission factors for energy sources.
Score 3	Estimated energy consumption based on floor area and energy performance/energy label, converted to CO_2e emissions using standard/average emission factors for energy sources.
Score 4	Estimated energy consumption based on floor area and building use, converted to CO_2e emissions using standard/average emission factors for energy sources.
Score 5	Estimated energy consumption based on averages by building use, converted to CO_2eq-emissions using standard/average emission factors for energy sources.

Grid Emission Factors

Consumed energy can be converted to CO_2e using emission factors. The US EPA's Emission Factors for Greenhouse Gas Inventories report compiles a standard and widely used set of emission factors. In Canada, the Department of the Environment publishes Technical Guidance on Reporting Greenhouse Gas Emissions with Canadian emission factors. When converting building electricity use to GHG emissions, care should be taken to use energy units—i.e., source or primary versus site energy—appropriate for the GHG emission factors. PCAF NA recommends using emission factors for grid baseload.

Building Characteristics

Various building characteristics can be taken into consideration to provide additional resolution to average energy consumption and emissions when actual data are unavailable. The US EIA's Commercial Buildings Energy Consumption Survey has data on average energy consumption by floorspace, principle building activity, region, number of floors, year constructed, and other characteristics. NRCAN provides tables on emissions and energy source/end use by industry and region.

Absolute vs. Relative Emissions

PCAF NA calls for reporting absolute emissions from the CRE portfolio. The reporting institution has the option to convert absolute emissions to relative emissions.

Avoided Emissions	The CRE asset class covers scope 1 and 2 emissions of commercial buildings. In the case that a real estate investment produces negative emissions (e.g., a net-negative energy building), it should be covered under the energy project finance asset class.
Other Considerations	In the case that building energy use is estimated, an optional energy efficiency discount factor (i.e., modifier) may be applied to account for energy performance that is different from the average, for example buildings with high efficiency features or efficiency energy labels. Such a factor can be applied to either overall building energy consumption or specifically to one component of energy use; for example, to discount electricity consumption in the case of a building with a solar PV array. If such a factor is used for energy estimation, its value and justification should be reported. If the discount factor exceeds 100% (i.e., the building is a net exporter of energy), it should be considered an energy project, and its emissions should be calculated using the methodology of that asset class.

Other Specific Considerations

Obtaining Data on Energy Consumption	Actual energy consumption data of CRE is preferred, however this information is unlikely to be available in existing portfolios. Furthermore, it will be challenging to collect this information going forward. Therefore, it is expected that most energy use will be estimated. To improve building energy use estimation, institutions may wish to collect data on building characteristics (e.g., size, building use, climate zone, and year constructed).
Off-Balance Real Estate Finance and Subsidiaries	The scope of this methodology is on-balance real estate finance; off-balance real estate finance is not included. If relevant, additional metrics can be included to disclose off-balance real estate.
Distinguishing between Private and Corporate CRE	No distinction is made between private or corporate CRE.

Limitations

Country-Specific Assumptions	Both the US and Canada lack widespread use of building energy labels, and access to a borrowers' measured consumption data may be challenging for financial institutions. 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 the use of average values. Collection of additional building data at loan origination in the future may improve estimation of energy use. Some cities and states are collecting building energy data and this could prove useful for some institutions.
Property Value	PCAF NA calls for using the property values as determined at the origination of the loan, both as a practical matter (property value is generally required at loan origination and may not be regularly updated) and as a conceptual one (the loan was made in relation to the original value, thus using loan outstanding to original value provides a consistent estimate of the proportion of the project attributable to the loan). If the property value is not available alternative sources may be used, such as tax assessment records. The property value should include the value of both the land and improvements.

Calculation Example

Description of Example	A calculation of the emissions attributed to a loan made for purchase of a restaurant in Missoula, Montana.
Data Used	Building energy use data are from the US EPA's *Commercial Building Energy Consumption Survey* (2012). Emission factors are from the US EPA's *Emission Factors for Greenhouse Gas Inventories* (2018). All GHGs calculated were converted to CO_2e using global warming potential values from the Intergovernmental Panel on Climate Change's (IPCC's) *Fifth Assessment Report* (2014).

Calculation and Results

A loan of $1.5 million was made for a local entrepreneur to purchase a restaurant. At the time of origination, the assessed value of the entire property was $2 million, and at the time of assessment the loan had an outstanding balance of $1 million. The attribution factor is therefore:

Attribution = (Loan value outstanding)/(Property value at time of originaion) = ($1 million)/($2 million) = 0.5

The restaurant floor area is 1,000 m^2. From the Commercial Building Energy Consumption Survey table C1 the US average annual energy consumption for the class "Food Service" is 0.484 MWh m-2 year-1 of site electricity* and 1.42 GJ m-2 year-1 of natural gas. GHG emission factors were taken from Emission Factors for Greenhouse Gas Inventories. For natural gas, the stationary combustion factors were used. For electricity, the factors used were total output for the Northwest subgrid (NWPP). Non-CO_2 GHGs were converted to CO_2 equivalents using IPCC AR5 global warming potentials without carbon cycle feedback. The total GHG emissions from the financed building are thus:

(energy consumption)/(area×year) × area × SUM _ghg (emissions factor ×GWP) = CO_2e/year

Energy consumption (annual)	Emission factor	CO_2e/year
484 MWh site electricity	295 kg CO_2e/MWh	143,000 kg
1,420 GJ natural gas	50.3 kg CO_2e/GJ	71,400 kg
Total		214,400 kg

Combining the attribution factor with the building GHG emissions give the total GHG emissions of the loan:

Loan absolute GHG emissions=0.5 x 215,372 kg CO_2e=107,686 kg CO_2e = 108 tCO_2e

This example calculation uses estimated average energy consumption based on floor area and building use along with average emission factors, and so receives a data quality score of 4.
This example shows the calculation for a single loan. When assessing an entire CRE portfolio, an attribution factor will need to be calculated for each loan. A calculation like the one above will need to be performed for each loan. Alternatively, subsets of the portfolio could be aggregated by relevant characteristics (e.g., total floor area per building type) and an appropriately-calculated average attribution factor could be applied (e.g., area-weighted average per building type).

*US data sources generally use imperial units, which have been converted to metric for this example.


WE Love
THIS Bar
BEER
love

2.5 Business Loans

Topic	Outcome
Asset Class Definition	Business loans includes on-balance sheet term loans and lines of credit to businesses, non-profits, and any other structure of organization for any purpose other than the development, acquisition, or rehabilitation of CRE. Business loans secured by real estate, such as CRE-secured lines of credit, are also included in the business loans asset class.
Scopes Covered	Scopes 1 and 2 at a minimum. Scope 3 should be included if relevant (e.g., at least 40% of total scope 1, 2, and 3 emissions combined) and information is available.[18]
Portfolio Coverage	100% of the on-balance sheet loan portfolio should be covered. However, off-balance sheet credit products do not need to be covered. For practical reasons, credit facilities linked to demand accounts may be exempted as the credit exposure is relatively small, highly volatile, and not structural (credit facilities linked to demand accounts extend credit in the event of deposit account overdraft).
Attribution	For business loans where actual third-party verified emissions data are available, the attribution is equal to the loan volume divided by the enterprise value. The enterprise value is defined as market cap plus debt or total assets. The calculated enterprise value of the organization should align with the coverage of the organization-provided emissions data. For business loans where actual emissions data are unavailable, a different approach is applied that incorporates attribution into the sector-average calculation—and only requires the amount of the lender's exposure. This simplifies the methodology for this asset class because while enterprise value or market cap is always calculated in the process of evaluating a loan application, these data may not be readily available in the aggregate at the loan portfolio level and could be too onerous to use as standard procedure for GHG accounting. To avoid this, an emissions/total assets per sector ratio is calculated, and the total loan volume per North American Industry Classification System (NAICS) is applied to determine the attributed emissions.

[18] Follows the Science Based Targets initiative's criteria for setting a scope 3 emissions target. www.sciencebasedtargets.org

Data

Based on the data available, the following data hierarchy is proposed:

Table 7. Data Quality Scoring for GHG Emissions

Data Quality (Highest to Lowest)	Description
Score 1	Audited GHG emissions data from the clients, in accordance with the GHG Protocol, combined with financial data (balance sheet total) from the clients
Score 2	GHG emissions data calculated by the client, and/or primary data, converted to CO_2e emissions using verified emission factors specific to the emissions source, combined with financial data (balance sheet total) from the clients
Score 3	Estimated GHG emissions based on primary data per type of sector, combined with estimated balance sheet total of the client
Score 4	Estimated GHG emissions based on specific studies (LCA or sector databases) per type of sector/organization, combined with estimated balance sheet totals[19]
Score 5	Extended Environmental Input Output (EEIO) databases (i.e., EXIOBASE or GTAP) that provide sector-level data on emissions per million dollar (balance sheet total) per country OR emissions intensity factors (emissions avoided per million dollars invested) per sector from own system or peer financial institutions

Actual Energy Consumption Approaches

For business loans, as with many other asset classes, those entities who provide actual third-party verified energy consumption data were considered first. The energy consumption is then multiplied by the emission factor and the attribution factor.

Sector-Average Approach

If actual energy consumption is unavailable, a sector-average approach is used. This approach relies on three key pieces of data sources:

Emission intensity factors per dollar of revenue by industry sector and country from the EXIOBASE Database.[20]

Asset turnover (equals revenue over assets) by sector.

Year-end loan amount. While an aggregate amount lent over the year might more fully capture the GHG emissions impact of a financial institution's investment of capital, it also runs the risk of overstating the attributed GHG emissions.

To calculate total emissions attributed to the business loan, the emission intensity factor is multiplied by the asset turnover ratio and the year-end loan amount.

[19] EXIOBASE has scope 1, 2, and 3 emissions for industry sectors and subsectors per unit of revenue. These emission factors should be multiplied by the asset turnover ratio and the loan volume provided by the financial institution to calculate the emissions for each business loan. Asset turnovers can be found here: https://csimarket.com/Industry/industry_Efficiency.php?s=400

[20] exiobase, "Welcome to Exiobase," https://www.exiobase.eu/.

	Other Approaches: PCAF expects that the emissions for most business loans can be calculated through either the actual energy consumption approach or the sector-average approach. However, PCAF allows the flexibility to use other approaches to calculate emissions if the actual energy consumption approach, or the sector-average approach cannot be used. For example, if data on industry total carbon emissions is not available for a specific region, it may be calculated using industry total energy use and applying a regional conversion factor that equates BTUs of energy consumption with tCO_2e. Alternatively, if no representative asset turnover ratios are available for the sector-average approach, other metrics, such as the enterprise value, may be used. The financial institution must explain the reasons for using an alternative approach if they deviate from the actual energy consumption approach, or the sector-average approach. The financial institution must aim to maintain consistency across units and unit conversions.
Absolute vs. Relative Emissions	PCAF NA recommends reporting absolute as well as relative emissions.
Avoided Emissions	Financial institutions may choose to include a separate calculation of avoided emissions that does not alter the absolute emissions of the entity. A business loan to a coffee distributor that distributes coffee by bicycle, for example, would not calculate the emissions avoided by comparing distribution via motor vehicle and reporting the emissions avoided by using bicycle (relative to motor vehicle) as a positive contribution that reduces the total emissions. It may be reported separately if the financial institution desires, but it should not substitute absolute emission reporting.

"We stand with our customers – from clean energy developers to environmental advocates – that are fighting against the threats of a warming planet. PCAF is the kind of initiative that helps us do our part in reducing emissions and reaching the goals of the Paris Climate Accords."

Keith Mestrich, President & CEO of Amalgamated Bank

Other Considerations

GHG accounting related to the business loans designated to financing energy production, energy transportation, and energy efficiency should be calculated using the energy finance methodology (Section 2.7).

Modifiers to the Sector-Average Calculated Emissions:
To the extent that a financial institution maintains data on its borrowers' certifications, these can be used to modify the total estimated emissions of the loan/investment when using the sector-average approach. Certifications may be derived from an evaluation of a business' products, building structure, or practices. Financial institutions using the PCAF methodology for GHG accounting might consider the following certifications, which are directly related to emissions:

- USDA Organic[21] or Canadian Organic Standards[22]
- Fair Trade USA[23] or Fairtrade Canada[24]
- Green Business Bureau[25]
- ENERGY STAR[26]
- Certified B Corporation[27]
- Forest Stewardship Council (FSC)[28]
- WasteWise (EPA)[29]
- WaterSense (EPA)[30]
- EPEAT (Green Electronics Council)[31]

With each certification, the total estimated emissions may be reduced by a modifier derived from a publicly available source. For example, a financial institution could cite EPA research on WasteWise-certified businesses that demonstrated a percent reduction in GHG emissions compared to GHG emissions at baseline or prior to WasteWise programming. The source from which a modifier is derived should be referenced from a comparison of GHG emissions between entities with the certification and those without. Financial institutions may also consider local/regional certifications such as the Bay Area Green Business Program in the San Francisco Bay Area of California. For each modifier, the financial institution should publish the modifier amount and its source.

It is possible that a financial institution finances a certified net-zero emissions project or business with no GHG emissions. However, a modifier should not exceed 100% and should never serve as an offset with a negative emissions value. Furthermore, a single loan or investment can only be modified once and cannot be multiplied with additional modifiers, in the case that an entity has more than one certification.

Modifiers are considered an interim element of the GHG accounting methodology and their utility is expected to sunset in the favor of verified emission.

[21] US Department of Agriculture, "USDA Organic," https://www.usda.gov/topics/organic.
[22] Canadian Food Inspection Agency, "Canadian Organic Standards," http://www.inspection.gc.ca/food/requirements/organic-products/standards/eng/1300368619837/1300368673172.
[23] Fair Trade Certified, https://www.fairtradecertified.org/.
[24] Fairtrade Canada, "Fairtrade Changes Lives," http://fairtrade.ca/.
[25] Green Business Bureau, https://greenbusinessbureau.com/.
[26] ENERGY STAR, https://www.energystar.gov/.
[27] Certified B Corporation, https://bcorporation.net/.
[28] FSC United States, https://us.fsc.org/en-us.
[29] US Environmental Protection Agency, "WasteWise," https://www.epa.gov/smm/wastewise.
[30] US Environmental Protection Agency, "WaterSense,"https://www.epa.gov/watersense.
[31] Green Electronics Council, https://greenelectronicscouncil.org/.

Limitations

One limitation of the sector-average approach is the generalized nature and necessary assumptions made in applying two factors that are averages (emissions per turnover and asset turnover). This makes calculations based on this approach generally less robust and more uncertain than those that are based on organization-specific data.

In addition, most financial institutions in the US and Canada use NAICS codes to track loans to sectors. However, the EXIOBASE Database that is used for establishing emission intensity factors does not track sectors by NAICS code. The NAICS sectors must be mapped to the sectors in the EXIOBASE Database to ensure consistency in methodology application. Similarly, the asset turnover ratios by sector must be mapped to the sectors in the EXIOBASE Database. The sectors from these two sources may not map one-to-one and may cause emissions to be over or understated for business loans.

There are also inconsistencies that exist due to measuring part of the business loan portfolio with organization-provided emissions data (which may encompass scopes 1, 2, and 3) while sector-average calculated data for the remainder of the portfolio will encompass only scopes 1 and 2. One mitigating factor, however, is that using organization-provided emissions data could improve the accuracy of the sector-average data if a financing entity has enough borrower-provided data points relative to the size of their portfolio in a given sector. For example, if a majority of the borrowers in a lender's textile manufacturing loan portfolio provide organization-produced emissions data, then these averages could be applied (instead of industry-wide sector averages) to the remainder of the borrowers in this sector who do not provide emissions data.

Another limitation in this methodology arises from the use of year-end outstanding balances. For a portfolio that includes loans to businesses in industries with high seasonal variability or temporal volatility, using year-end outstanding balances may not capture the activity occurring during seasons that do not overlap with the end of the year. Similarly, financial institutions using different fiscal calendars may be less comparable across other financial institutions. Institutions could opt to conduct their GHG accounting using average monthly balance for the year, instead of a year-end balance, if possible.

Calculation Example

Description of Example 1	Coastal Enterprises, Inc. (CEI) – Livestock Farm, Poultry CEI is a Maine-based Community Development Financial Institution. CEI recently financed a small operating livestock farm in rural Maine. CEI's $230,000 loan financed the move to a larger property to accommodate the business's growth. The farm specializes in pasture raised, organic meats, particularly chicken and turkey as well as some beef and pork. Maine Farmland Trust will acquire a farmland preservation easement on the property to preserve it as agricultural land, which will also be certified organic. The NAICS code for the borrower is 112120.
Data Used	EXIOBASE emissions, sector revenue and sector asset turnover ratio.

Calculation and Results	To calculate the carbon emissions of this loan, PCAF NA uses the emissions intensity of the sector financed from EXIOBASE, which has sector emissions and revenue data for agriculture, hunting, and forestry, with a sub-sector for poultry. The total scope 1 and scope 2 emissions for this sector are 19,341 ktCO_2e, and total revenues are €35,972 million. PCAF NA applies the USD/EUR exchange rate of 1.40, which reflects the exchange rate for when Exiobase was developed. Dividing the sector emissions by the revenues of $50,361 million yields an emission intensity per million dollars of revenue of yields an emission factor of 384 tCO_2e per million USD revenue for scope 1 and 2 emissions combined. PCAF NA then multiplies the asset turnover ratio to the emission factor per million dollars of revenue. The asset turnover ratio equals the revenue the business generates per dollar of loan received. Asset turnovers are taken from the CSI Market data. In this example an asset turnover of 0.91 is applied for the noncyclical consumer goods sector. (Noncyclical consumer goods are defined as goods produced by fishing and farming operations; processing and production of food, beverages, and tobacco; manufacturers of household and personal products; and providers of personal services). Multiplying the emission factor of 384 tCO_2e per million USD revenue by the asset turnover of 0.91 USD Revenue per USD of loan equals 349 tonnes CO_2e per million USD in loans. Lastly, PCAF NA multiplies the emission factor of 349 tonnes CO_2e per million USD in loans by the loan amount of $230,000 (equals $0.23 million), to yield total GHG emissions of 80 tonnes CO_2e with this loan.

Calculation Example

Description of Example 2	Beneficial State Bank is headquartered in Oakland, California and serves the Pacific Coast with 17 branches across California, Oregon, and Washington states. Its commercial lending practice supports the development and preservation of affordable housing, pre-prime consumer auto loans, and socially and environmentally responsible businesses. One sector they finance is the manufacturing of organic and ethically sourced soap and beauty products such as lotions, oils, and shampoos. No clients in this portfolio conducted a third-party audited GHG emissions evaluation. Beneficial State Bank held an outstanding $13.5 million at year-end 2018 in this sector, its NAICS code is 325612. Because there is no emissions data available for this NAICS sector, PCAF NA approximates for the closest sector emissions.
Data Used	US EIA, EXIOBASE sector revenue, CSI Market.

Calculation and Results	To calculate the GHG emissions of this loan, PCAF NA looks for the total emissions intensity of the sector financed. EXIOBASE was used as it has sector emissions and revenue data for food production, beverages, and tobacco. These totals are 101,155 kt CO_2e and €312,793 million. Applying an USD/EUR exchange rate of 1.40, this is $437,910 million. Dividing these two factors, PCAF NA calculates a total of 231 tCO_2e per million USD revenue for scope 1 and 2 emissions combined. PCAF NA then applies an asset turnover ratio of 0.91, taken from the CSI Market data source of asset turnovers by sector for the noncyclical consumer goods sector (noncyclical consumer goods are defined as goods produced by fishing and farming operations; processing and production of food, beverages, and tobacco; manufacturers of household and personal products; and providers of personal services). PCAF NA calculates a total of 210 tonnes CO_2e per million USD in loans by multiplying the emission factor per million dollars of revenue by the asset turnover ratio. Lastly, PCAF NA multiplies the emission factor of 210 tonnes CO_2e per million USD in loans by the total outstanding loan value of $13.5 million to yield total GHG emissions of 2,838 tCO_2e by lending in this sector.

Regional Alignment

PCAF NA methodology diverges from the PACF NL methodology in several ways:

- The North America methodology includes lines of credit in its coverage, whereas the Netherlands methodology excluded them.
- PCAF NL instituted a €5 million size threshold beyond which business loans must use the organization-provided GHG emissions data. Because few enforced GHG reporting mechanisms exist in the US, the PCAF NA methodology does not use this requirement at any threshold.
- Similar to the Netherlands methodology, the PCAF NA approach uses a sector-average approach to calculate carbon emissions. But rather than applying an attribution factor of loan:enterprise value as the Netherlands methodology does, the PCAF NA approach uses sector-total revenue and sector-average financial ratios (e.g., asset turnover) to calculate a financial institution's contribution to GHG emissions in each sector of its business lending.
- The PCAF NA methodology also employs modifiers to account for the lower GHG emissions of borrowers who hold specific third-party certifications related to emissions, energy and/or resource use.

> *"PCAF is helping CEI understand the importance of carbon accounting to our work as a financial institution committed to doing our part to address the climate crisis. Addressing this crisis will require significant investment from financial institutions, and we need to understand the carbon profile of our portfolios."*
>
> **Keith Bisson**, President of CEI

2.6 Listed Equity

Topic	Outcome
Asset Class Definition	This asset class includes all listed equity on the balance sheet and/or actively managed by the financial institution. These include: • Common stock • Preferred stock • Treasury stock • Exchange traded funds
Scopes Covered	Scope 1 and scope 2 minimum. Scope 3 if available and relevant (over 40% of scope 1, 2, and 3 combined).
Portfolio Coverage	Of the portfolio, 100% should be covered. If full portfolio coverage is not possible, provide the names of the product types (futures, exchange traded funds, fund of funds, external mandates, preferences) that were excluded and an explanation of why. Cash positions can be considered as having zero emissions. Short positions can be ignored.
Attribution	PCAF proposes that emissions are proportionally attributed to the providers of the organization's total capital. To prevent double counting from this perspective, emissions are attributed proportionally to the exposure divided by the sum of enterprise value. In case a financial institution only invests in equity and undertakes GHG accounting from a risk perspective, emissions can also be attributed to the total market capitalization (market value of all of an organization's outstanding shares) of this organization. This follows the so-called ownership approach and is aligned with financial reporting and consolidation rules. It also aligns voting rights and rules for reporting substantial interest in listed companies.

Data

Based on the data available, the following data hierarchy is proposed:

Table 8. Data Quality Scoring for GHG Emissions

Data Quality Score (Highest to Lowest)	Description
Score 1	Audited GHG emissions data from the clients or third-party data provider, in accordance with the GHG Protocol, combined with financial data (enterprise value) from the clients.
Score 2	Non-audited GHG emissions data and/or primary data from the clients or third-party data provider, where primary data is converted to CO_2e emissions using verified emission factors specific to the emissions source, combined with financial data (enterprise value) from the clients.
Score 3	Estimated GHG emissions based on primary data per type of sector (provided by third-party data provider), combined with estimated enterprise value of the clients.
Score 4	Estimated GHG emissions based on specific studies (LCA or sector databases) per type of sector/company, combined with estimated enterprise values.
Score 5	EEIO databases (i.e., EXIOBASE or GTAP) that provide sector-level data per country on emissions per million dollar of revenue, OR Emissions intensity factors (emissions avoided per million euro invested) per sector from own system or peer financial institutions.

Official Organization Filings:
PCAF recommends using energy and emissions data reported by companies, given that the data fully covers the emissions generating activities of the organization that are disclosed in official filings and (environmental) reports.

Data Providers:
If the organization does not report energy use and emissions data, PCAF recommends using third-party data providers, such as CDP, Bloomberg, MSCI, Sustainalytics, Trucost, ISS ESG Solutions, Kepler Cheuvreux etc. The data providers typically make available scope 1 and 2 emissions data. PCAF recommends using data providers that use the standardized CDP framework and recommends data providers to disclose the data quality score according to the above scoring hierarchy.[32] Disclosure through CDP has the advantage that the data are accompanied by additional information on the scope and methodology. If the CDP disclosures are unavailable, financial institutions may use data providers that provide data in other formats.
If using data providers, PCAF recommends using the same provider for all equity due to variability of scope 1 and 2 emissions observed by providers. For example, analysis of multiple providers showed that that for scope 1 and 2 emissions between data vendors may vary by 12%-24%.

Estimation Models:
Not all companies disclose data on their emissions in official filings or through data providers. Reporting in emerging markets lags developed markets. If no data are available, estimation models consistent with the emissions from the primary business activity may be used. Production-based models are preferred over revenue-based models, because they are less sensitive to exchange rate or commodity price fluctuations. Production-based models are especially useful for carbon-intensive industries like utilities, materials, energy, and industrials. Revenue-based models (e.g., intensity-based or environmental input-output models) have the advantage of requiring less detailed data.

[32] CDP, https://www.cdp.net/en.

Absolute vs. Relative Emissions	As a minimum, PCAF suggests disclosing both absolute and relative emissions. For relative emissions, it is recommended that the absolute GHG emissions impact is divided with the total assets under management.
Avoided Emissions	Avoided emissions are not appropriate for this asset class.

Other Considerations

Aggregation of Output	A financial institution may choose an appropriate level of aggregation of outputs (for instance, should the overall portfolio footprint be reported), or whether aggregation at more homogenous sub-levels is more relevant (for instance, advanced and emerging markets).

Limitations

Market Price Fluctuations	When using market cap as the denominator it is important to realize that assets under management change as a result of a fluctuating market price.[33]
Organization Identifiers	For larger portfolios, it is important to have organization identifiers to combine information from various sources. Examples of such identifiers are: Stock Exchange Daily Official Lists, International Securities Identification Number, Committee on Uniform Security Identification Procedures numbers, and Bloomberg Tickers. For large portfolios, matching external data sources can be a challenge when for example two companies merge; the organization identifiers will be adjusted immediately while carbon data providers might only update such information on an annual basis.

[33] A possibility to overcome this would be to use normalized assets under management, whereby prices are held constant over the target period. Such adjustments should be made transparent.

Calculation Example

Description of Example

The absolute GHG emissions of an investment in an organization is calculated by multiplying the total emissions by the proportional share in the organization. The absolute footprint of a portfolio of companies is calculated as the sum over all emissions at a certain moment in time (t).

(1) $$absolute\ GHG\ emissions_t = \sum_{company \in portfolio} \frac{invested\ value_t}{enterprise\ value_t}\ emissions_t$$

(2) $$relative\ GHG\ emissions_t = \frac{absolute\ GHG\ emissions_t}{AuM_t}$$

When using market capitalization as the denominator instead of enterprise value, the absolute GHG emissions is calculated as follows:

(1.2) $$absolute\ GHG\ emissions_t = \sum_{company \in portfolio} \frac{invested\ value_t}{market\ cap_t}\ emissions_t$$

Data Used

The information required for these calculations includes:

Emissions: Can be taken from organization reports if available but for large portfolios external data providers are often used. Examples of data sources include: CDP, Bloomberg, MSCI, Sustainalytics, Trucost, ISS ESG Solutions, Kepler Cheuvreux. In choosing a data source, asset managers will have to compare the various options (for example on coverage, data quality, transparency, service, costs).

Market capitalization: Total borrowings, customer deposits—this information is widely available in commercial market intelligence tools and commercial providers of financial data that are used by investors.

Invested value: This information is normally available in the internal systems used by investors for portfolio management and performance monitoring.

Calculation and Results

Fund I is composed of two listed companies and contains $5 million cash.

Organization	Market Cap	Total Debt	Cash (Customer deposits)	Enterprise Value	Invested	Total Emissions
A	37.5 billion	14.5 billion	0	52 billion	100 million in a-shares and 50 million in b-shares	500 tCO_2e
B	18 billion	4 billion	0	22 billion	90 million	400 tCO_2e
Cash					$5 million	
Total invested					$245 million	

Using Enterprise Value as denominator:
Total emissions organization x (invested value / (market cap + total debt + cash))
For organization B: 400 x (90 million / (18 billion + 4 billion + 0 billion)) = 400 x 0.41% = 1.64 tCO_2e)
For organization A: 500 x (150 million / (37.5 billion + 14.5 billion + 0 billion) = 500 x 0.29% = 1.44 tCO_2e)
For cash in the fund no emissions are attributed
Total absolute GHG emissions impact = 1.64+1.44 = 3.08 tCO_2e

The relative GHG emissions impact is calculated by dividing the absolute GHG emissions impact over the invested value (per million).
Total relative GHG emissions impact = absolute footprint / invested value per million invested
Total relative GHG emissions impact = 3.08 tCO_2e / 240 = 12.8 kg CO_2e per million invested

Using only market cap as denominator:
Total emissions organization x (invested value / market cap)
For organization B: 400 x (90 million / 18 billion) = 400 x 0.5% = 2 tCO_2e
For organization A: 500 x (150 million / 37.5 billion) = 500 x 0.4% = 2 tCO_2e
For cash in the fund no emissions are attributed
Total absolute GHG emissions impact = 2+2 = 4 tCO_2e

The relative GHG emissions impact is calculated by dividing the absolute GHG emissions impact over the invested value (per million).
Total relative GHG emissions impact = absolute footprint / invested value per million invested
Total relative GHG emissions impact = 4 tCO_2e / 240 = 16.7 kg CO_2e per million invested

It is recommended to use:

- Emissions (GHG) data and organization revenue (for carbon intensity) of the same year
- Enterprise or market cap value and portfolio composition data from the same cut-off date (e.g., end of reporting period)

For example, when calculating the GHG emissions per end 2019, the equation will probably use:

- Organization GHG emissions data from 2018, and end-2018 organization revenue
- December 31, 2019 EV/market cap, and portfolio composition data

2.7 Energy Finance

Topic	Outcome
Asset Class Definition	On-balance-sheet project finance loans for the purpose of constructing, acquiring, or refinancing renewable and non-renewable energy producing plants. This category also includes project finance loans for energy efficiency improvements.
Scopes Covered	Scope 1 and 2 of the project or scope 1 and 2 avoided by the project.
Portfolio Coverage	100% of the on-balance sheet energy and energy efficiency project finance loans.
Attribution	The attribution will be allocated between the individual providers of debt, equity, or mezzanine debt, depending on the specific capitalization of the project. The ratio of each providers' capital as a proportion of the total project costs will be used to attribute the total project GHG emissions. Initially, and before any debt repayments have been made, the attribution factor is the amount of debt and/or equity contributed by the individual capital provider divided by the total project cost. As debt is gradually paid back, GHG emissions can be attributed using the actual remaining outstanding loan balance. For debt in which principal is repaid over the term of the loan, this means adjusting the numerator of the attribution factor annually, reflecting the end-of-year loan balance. This results in the attribution factor decreasing to zero at the end of the loan term when it is fully repaid. As the debt decreases over time, and with it the attribution to debt providers, more of the emissions are attributed to the equity providers. A simplified approach would be to keep the denominator constant over time (unless additional debt and/or equity is invested to pay for cost-overruns or the like) and by attributing the part of the debt that has been paid back pro rata to the equity holders. Using this approach, the attribution factor for a debt provider would be calculated as follows: $$\text{Debt Attribution factor} = \frac{\text{Outstanding debt of the debt provider}}{\text{total debt plus equity invested in project}}$$[34] The attribution factor for an equity provider would be calculated as follows: $$\text{Equity Attribution factor} = \frac{\text{Equity invested by the equity provider}}{\text{total debt + equity invested in project}}$$

[34] "Total debt plus equity invested" means the total debt plus equity invested to realize the project, staying constant over time, unless additional debt and/or equity is raised.

Data

Within the due diligence and monitoring of an energy project finance transaction, the availability and quality of project-specific data is generally good. As a result, higher quality GHG data can be obtained than would be available through generic input/output models without adding an unrealistic amount of additional work to the process. Therefore, it is proposed that GHG data for energy project finance should not be based on generic input-output/ sectoral models, but on project-specific source data.

Where project-specific data are not available, it is good practice to use default factors based on sector-specific activity data and through the application of documented emission factors. Emissions will be estimated by multiplying activity data, such as the volume of fuel consumed or energy produced, by a project-specific or an industry default emission factor.

A combination of methodologies can be used where appropriate.

Project-specific, independently validated GHG data ranks highest in quality and consistency but will not always be available. The next-best level of data quality and consistency that can be obtained practically is to calculate the GHG emissions from relevant non-GHG source data provided by the client (like the consumption of electricity, of fuels, and of certain sector-specific raw materials), using credible standardized calculation tools. Only if neither options work is it acceptable to use non-validated GHG data provided by the client or to use data from sector-average input/output models.

The following hierarchy of data quality scoring is proposed:

Table 9: Data Quality Scoring for Renewable Electricity Generation

Data Quality (Highest to Lowest)	Description
Score 1	Actual annual production (kilowatt-hours) of the project, multiplied by combined margin emission factor of International Finance Institution (IFI) Harmonization approach.
Score 2	vEstimated annual production (kilowatt-hours) based on P50 assessment of potential production, multiplied by combined margin emission factor of IFI Harmonization approach for project finance.[35]
Score 3	Project-specific GHG data, calculated by independent expert in accordance with the GHG Protocol and/or UNFCCC or another credible certification scheme.
Score 4	Estimated annual production (kilowatt-hours) based on capacity (megawatts) of project combined with average load factors per country.
Score 5	Emissions intensity factors (emissions avoided per million euro invested) per technology from own system or peer financial institutions.

[35] United Nations Climate Change, "IFIs – Harmonization of Standards for GHG Accounting," https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting.

Table 10: Data Quality Scoring for Fossil Fuel Electricity Generation

Data Quality (Highest to Lowest)	Description
Score 1	Actual annual fuel combustion of the power plant, converted to CO_2e emissions using verified emission factor specific to the type of energy consumed.
Score 2	Actual annual production (kilowatt-hours) of the power plant, converted to CO_2e emissions using verified performance factors of the power plant combined with emission factor specific to the type of energy consumed.
Score 3	Project-specific GHG data, calculated by an independent expert in accordance with the GHG Protocol and/or UNFCCC or another credible certification scheme.
Score 4	Estimated annual fuel combustion based on capacity (megawatts) of power plant combined with average performance factors per country combined with emission factors specific to the type of energy consumed.
Score 5	Emissions intensity factors per type of power plant from own system or peer financial institutions.

Table 11: Data Quality Scoring for Energy Efficiency

Data Quality (Highest to Lowest)	Description
Score 1	Actual measured energy savings (fossil and/or electricity) compared to baseline, converted to CO_2e emissions using verified emission factors specific to the type of energy saved from defined fuel source.
Score 2	Actual measured energy savings (fossil and/or electricity) compared to baseline, converted to CO_2e emissions using emission factors for energy saved from undefined fuel source.
Score 3	Project-specific energy savings/GHG emissions reductions, calculated by independent expert in accordance with a credible scheme.
Score 4	Estimated energy savings per technology and state (fossil and/or electricity) compared to baseline, converted to CO_2e emissions using emission factors for energy saved from undefined fuel source.
Score 5	Energy savings/emissions reductions factors (emissions avoided/saved per million euro invested) per type of technology per count.

When estimating the expected GHG emissions of a project at the time the investment is made (i.e., when the project is not yet operational), it is essential that the methodology provides guidance on the way the annual production is estimated (conservative/neutral/aggressive scenario). For renewable energy projects it is customary to have experts

calculate percentile production predictions based on an analysis of historic data (sun, wind, irradiation, hydraulic flow). Typical production values are measured at P50 or P90. The P50 value is the predicted annual production for which there is a 50% probability that it will be exceeded in a given year (the 1-year P50), or of being exceeded in an average year over a 10-year period (the 10-year P50). The P90 value has a probability of 90% 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 NA proposes to use the P50 predicted production.[36]

Absolute vs. Relative Emissions

The standard approach should be reporting absolute as well as relative emissions, where as the relative emissions are the emissions divided by the total outstanding debt and equity.

Baseline Emissions

Measuring baseline emissions is a useful complement to absolute emissions. It provides a credible alternative scenario "without" the project, against which the "with" project scenario can be compared – giving an indication of how, measured in GHG emissions, the proposed project performs. However, the "without" project scenario, or baseline, is theoretical and incorporates an additional level of uncertainty beyond those involved in estimating absolute emissions.

The project baseline scenario (or "without" project scenario) is defined as the expected alternative means to meet the output supplied by the proposed project. The baseline should consider the most likely alternative scenario in the absence of the project being built. For example, the baseline scenario for a new solar PV plant might be the equivalent energy production sourced from the local utility's coal- or gas-fired power plant.

Avoided Emissions

Avoided emissions are the reduction in emissions that the financed project produces versus what would have been emitted in the absence of the project (the baseline emissions). For renewable energy projects, this is the difference between the project emissions and the emissions from the production of the same amount of electricity in the most likely alternative scenario in the absence of the project. For energy efficiency projects, this is the difference between baseline emissions and the emissions after implementing a reduction measure.

PCAF NA proposes following the IFI Approach to GHG Assessment in the Renewable Energy Sector where a default combined margin (CM) emission factor is calculated based on UNFCCC's Clean Development Mechanism (CDM) practices:[37]

For Solar and Wind Generation:

CM = [0.75 x Operating Margin (OM)] + [0.25 x Build Margin (BM)]

For All Other RE Generation:

CM = [0.50 x OM] + [0.50 x BM]

Each country OM is assumed to be the average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system as published by the IEA. Each country BM is assumed to be the most efficient fossil fuel electricity generation available by country according to the IEA.

The CM calculation above can be superseded by either of the following: 1) A country grid emission factor for electricity supply based on UNFCCC CDM methodology, third-party validated, and published by the host country

[36] The P50 value is an estimate of the average production, since half of the year's output is expected to exceed this level and the other half is expected to fall below it. This is the most likely outcome in any given year.

[37] United Nations Climate Change, "IFIs – Harmonization of Standards for GHG Accounting," https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting.

	within the past two years; or 2) An authoritative, transparent, project-specific study. The IFI Working Group publishes the OM and BM emission factors on a regular basis for various countries. PCAF recommends to always use the latest version of the IFI publication.

Other Considerations

Life Cycle Emissions	For most renewable energy projects, upstream, downstream, and leakage GHG emissions sources are considered negligible and are generally excluded from GHG calculations. Although upstream emissions such as construction or embedded GHG emissions in materials can be large in some cases (e.g., hydro), when annualized over the project life these one-time emissions constitute less than 5% of the GHG reduction calculation in most cases. Leakage is also excluded from smaller renewable energy project-types as they will not materially affect third-party behavior. Where relevant and available, life cycle emissions, including emissions related to the manufacture, transport, installation, and disposal of the equipment and materials used in an energy project, should be accounted for to incentivize more efficient production in the future. However, PCAF NA recognizes that data sources for the emissions from the construction and decommissioning of energy projects may not be readily available.
Accounting Timeframe	The most commonly adopted accounting principle for GHG emissions is to account for and report on the actual emissions that occurred in the portfolio during the most recently completed reporting period (usually a calendar year). This approach is also proposed for energy project finance. However, energy project finance inherently relates to an activity that will only start after development, construction, and commissioning have been completed, which is often years later—maybe even after the institution that provided the project finance is no longer exposed because it has been sold or otherwise refinanced. To account for the impacts of investment decisions in the year that these investments are being made, several (development) finance institutions calculate and report on estimated future (ex ante) annual GHG emissions for all new investments in a given year of operation. PCAF NA proposes that the methodology provides for both ex ante (estimated) and ex post (actual) emissions.
Boundary Setting	The boundaries (both for the GHG emissions calculation and for the attribution) are determined by the project; if the project is not fully greenfield (i.e., a newly built project), only the financed extensions are included, and the emissions and financials related to the existing activities and/or installations are not considered.
Combined Projects	Some energy projects encompass both energy efficiency and renewable energy measures (i.e., LED lighting retrofit and PV solar panels). In such instances, both the absolute emissions from the energy efficiency (and/or non-renewable energy portion) of the project and the avoided emissions resulting from these measures should be calculated and reported.

Limitations

Emission Data	The availability of relevant project-specific data are high in energy project finance relative to some of the other asset classes. However, expert GHG emission reports specific to the project will often not be available. Instead, the emissions data will be based on project-specific source data, being calculated into emissions data using sector- and country-specific factors.
Life Cycle Emissions	This methodology proposes to neglect life cycle emissions if they are smaller than 5% of total lifetime (avoided) emissions. If bigger than 5%, these emissions should be accounted for. In most cases, this must be based on generic model-based data. PCAF NA proposes to account and report for the emissions related to construction only in the years in which the emissions occur, so only during the construction period. It is not yet agreed how to attribute them over the reporting years.
Transmission and distribution	Transmission and distribution systems such as oil pipelines are not included in the scope of this asset class. PCAF NA proposes that these systems will be recognized as a unique asset class in future versions of the report.

"The importance of the role of the financial sector in combating climate change is huge. There's a necessity to mobilize trillions of dollars in a very short timeframe. We need to mobilize capital and shift it to where it's needed as quickly as possible. NGFS is working to standardize the way we measure risk. This is extremely important to us and this area is still in its infancy. We need initiatives like the Partnership for Carbon Accounting Financials to standardize the measurement of GHG emissions of loans and investment. The link between TCFD and carbon accounting is very clear to me. TCFD is a great initiative, it's a game changer, but it's a framework and not a standard. PCAF provides that level of granularity that could contribute to achieving a consistent implementation of TCFD."

Morgan Deprés, Head of Secretariat Network for Greening the Financial System (NGFS) and Deputy Head Financial Stability Department of Banque de France

Calculation Example: Commercial Solar Project

Description of Example	A calculation of the avoided emissions attributed to a commercial solar project.
Data Used	• Solar electricity production from an independent engineering report engaged by the financial institution for the project. • Emissions data as published by the IFI, CO_2 emissions per kilowatt-hour from electricity generation.
Calculation and Results	A loan of $1,800,000 was made for the construction of a rooftop solar PV system at a retail shopping center in Salinas, California. The total cost of the project was $3,483,000, with the balance of the cost coming from equity. The entire loan amount was expected to be disbursed within a 6-month construction window. The attribution factor follows: $$Attribution = \frac{Loan\ value\ outstanding}{Total\ project\ cost} = \frac{\$1,800,000}{\$3,483,000} = 0.517$$ An independent engineering report commissioned by the financial institution calculated annual production for the system to be 1.676 MWh, based on PVSyst projections using typical meteorological year data. This output made up under 58% of the shopping center's annual electricity usage. To calculate the baseline GHG emission factor (i.e., the emissions that would result in the absence of the solar project) the contribution margin from the average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system and from the most efficient fossil fuel electricity generation available by country must be computed. The baseline CM calculation follows: $$CM = (0.75 \times 548\ kgCO_2/MWh) + (0.25 \times 408\ kgCO_2/MWh)$$ The contribution margin multiplied by the solar system output results in the avoided emissions for the project. $Avoided\ emissions = 1.676\ MWh \times 513\ kgCO_2/MWh = 859.788\ kgCO_2$ Multiplying the attribution factor by the total avoided emissions gives the avoided emissions impact of the loan: $Loan\ GHG\ emissions\ impact = 0.517 \times 859.788\ kg\ CO_2e = 444.510\ kg\ CO_2e$

Calculation Example: Fossil Fuel Plant

Description of Example	A calculation of the avoided emissions attributed to the financing of a coal plant operation.
Data Used	Coal plant production from the energy organization engaged by the financial institution for the project. Emissions data as published by the IEA CO_2 emissions per kilowatt-hour from electricity generation.
Calculation and Results	A loan of $10 million was made for the operation of a theoretical bituminous coal plant in Alabama. The total cost of the project was $100 million, with the balance of the cost coming from equity. The attribution factor is therefore: $$Attribution = \frac{Loan\ value\ outstanding}{Total\ project\ cost} = \frac{\$10\ million}{\$100\ million} = 0.1$$ To find the total emissions production of an average plant that generates 600 MWh annually, the annual fuel use (in energy units, volume or mass) is multiplied by an emission factor, and then multiplied by an adjusting units factor. $$\frac{600\ MWh}{year} \times \frac{3.412x10\text{^}6BTU}{MWh} \times \frac{205.3lbCO_2}{1MBTU} = 190.6\ tCO_2/year$$ The loan covers 10% of the plant and therefore is responsible for 19 tCO_2/year.

Calculation Example: Residential Energy Efficiency Project

Description of Example	A calculation of avoided emissions attributed to a residential weatherization project
Data Used	Emissions data provided by an energy efficiency utility.
Calculation and Results	A loan of $5,000 was made to a homeowner for a weatherization project to improve the thermal retention efficiency of the home. The total project cost was estimated at $8,411. The project was evaluated and proposed by a technician certified by a public energy efficiency utility. The proposal estimated that the annual heating savings as a result of the energy efficiency measures would 20.5 MMBtu or 3,131 pounds per CO_2e. The attribution factor is determined by dividing the loan value by the cost of the project: $5,000 / $8,411 = 0.59 Applying the attribution factor to the annual savings (in pounds per CO_2e) and multiplying by the tCO_2e conversion factor results in the annual avoided emissions for the project financing: 0.59 X 3,131 lb CO_2e X 0.0004535 $tCO_2e/lbCO_2e$ = 0.844 tCO_2e

Weatherization/ Insulation							
Cost of Project	Loan Value Out-standing	Total Heating Usage MMBtu	Heating Usage Reduction MMBtu	Annual Pounds per CO_2e Savings	Percent of Project Financed	Annual tCO_2e Savings	Finance Avoided tC02e
$8,411.00	$5,000	189.4	20.5	3,131	59%	1.420	0.844

Regional Alignment

The primary difference between PCAF NA and PCAF NL is the scope of the PCAF NA asset class, which includes projects related to energy production/distribution and energy efficiency improvements, while PCAF NA also covers fossil fuels. The methodology is the same for the US and Canada.

2.8 Motor Vehicle Loans

This section covers consumer motor vehicle loans of the various types described below. For this protocol, motor vehicle loans are limited to the loans that are on the balance sheet of the financing institution and do not include motor vehicles listed as collateral for other types of loans.

Loans to businesses that have the purpose of purchasing a vehicle or have vehicles as collateral are assumed to be accounted for in the business loans asset class, and as part of the overall emissions of that business.

Topic	Description
Asset class definition	This asset class includes the following consumer motor vehicle types in a bank's loan portfolio: 1. Passenger car and passenger light truck 2. Motorcycles and scooters 3. Snowmobiles/ATVs 4. Boats, including marine spark ignition engines This asset class also includes the following motor vehicles; however, PCAF did not find reliable emissions data for these: 1. Motorhomes This asset class does not include: 1. Mobile homes (stationary) 2. Commercial vehicles such as buses, heavy duty trucks, or marine compression ignition
Scopes covered	This methodology will cover scopes 1 and 2 of motor vehicles, in alignment with the World Wildlife Fund's Science Based Targets for Transportation: Scope 1 – direct emissions from fuel combustion; scope 2 – indirect emissions from electricity generation consumed in EVs. PCAF NA notes that this accounting method will relatively overcount the emissions of EVs, but believes it is appropriate to use both because of its alignment with the Paris Agreement (setting science-based targets) and the approach of accounting for as many emissions as possible. It will not cover scope 3 emissions related to the production of vehicles, delivery of vehicles to buyer, or decommissioning of vehicle after use.
Portfolio coverage	100% of the on-balance finance for the purchase or refinance of all motor vehicles of the types described above. It does not include vehicles used as collateral for other loan purposes (a personal loan for other uses, for example).
Attribution	100% of annual emissions, due to high unlikelihood of more than one loan for vehicles.

Data

The score of any calculated emission is that of the lowest-quality scoring element of the calculation (e.g., an emission calculated using a Score 3 and a Score 5 data point will be considered a Score 5)

Based on the data available, the following data hierarchy is proposed:

Table 12: Data Quality Scoring for Calculation Data Points

Data Quality (Highest to Lowest)	Description
Score 1	Actual fuel consumption (fossil and/or electricity)
Score 2	Known vehicle efficiency and actual vehicle distance traveled
Score 3	Estimated fuel consumption (fossil and/or electricity) using: • Known vehicle efficiency • Known fuel type • Estimated distance traveled based on more detailed information (region, age of driver)
Score 4	Estimated fuel consumption (fossil and/or electricity) using: • Vehicle efficiency based on some information (region, vehicle class) • Fuel type based on some information (region, vehicle class) • Estimated distance traveled based on national averages for consumer vehicle usage
Score 5	Average national fuel consumption (fossil and/or electricity) of vehicle type

Absolute vs. Relative Emissions

Standard approach should be reporting absolute and relative emissions.

Avoided Emissions

This methodology will not account for avoided emissions. However, to encourage and highlight bank activity that reduces emissions, loans to low and zero-emission vehicles as well as loans with the purpose of motor-vehicle-related emissions reductions, may be separately accounted for.

Emissions Reduction Goals and Methods	Financial institutions with consumer vehicle portfolios can set emission reduction goals such as increasing the percentage of clean vehicles in the overall vehicle portfolio by a certain amount each year, and/or decreasing the per-vehicle emissions average in their portfolio by a certain amount. Financial institutions can encourage and incentivize customers to purchase cleaner vehicles through beneficial fees, interest rates, and terms (like Vermont State Employees Credit Union and VanCity Credit Union), participating in public or private grant programs that reduce the vehicle cost for borrowers, such as the California Air Resources Board Clean Vehicle program that Beneficial State Bank participates in. Financial institutions can also incentivize dealer partners to increase clean vehicle sales and can offer consumer marketing and promotions that encourage and celebrate clean vehicle purchases. While selling off higher emissions vehicles is one way to achieve emissions reductions of the portfolio, it does not reduce actual emissions to the atmosphere and should not be considered a valid approach to portfolio emissions reductions. Year-over-year emission reporting should include not only the absolute and relative actual change in emissions, but also a description of how any emissions reductions were achieved.

Other Considerations

CO_2 vs. CO_2e data	Many vehicle emissions data include only CO_2 emissions. Other GHGs are often neglectable.

Limitations

Data Availability	Information regarding actual usage may not be easily available. If actual usage is unavailable, PCAF proposes to use the average usage by state or province. Various governmental agencies and car insurance companies provide this data. In addition, PCAF proposes that financial institutions collect the vehicle make and model to determine the fuel economy. US EPA maintains a detailed database with fuel economy data for all auto, motorcycle, snowmobile, and spark ignition engines used in boats. US EPA also tracks fuel type for each make and model, which can be used to select the appropriate emission factor. If the financial institution does not track the vehicle make and model, PCAF proposes to determine the fuel economy using the weighted average fuel economy by vehicle type (light duty, heavy duty).
Data Availability for Motorhomes	PCAF did not find reliable publicly available data to determine emissions for motorhomes at this point.
Dual Fuel Vehicles	For dual fuel the percentage of usage per fuel may be unknown. The EPA Fuel Economy vehicle database includes fuel splits for vehicles with dual fuel. If the vehicle make and model is unknown, the average split between fuels by vehicle class (sedan, SUV) shall be used.
Regional Data: Grid Emissions	Exact electricity source data will not be known for each vehicle in a bank's portfolio. Where possible, most-common regional electricity source data for the borrower's location will be used. If unavailable, most-common regional electricity source data for the bank branch will be used. If unavailable, country-level electricity source emissions data will be used.

Calculation Example

Description of Example	Beneficial State Bank has a consumer vehicle loan portfolio of approximately 8,000 borrowers, totalling $78 million in loan dollars outstanding. The bank also regularly purchases truck loans from a community development lender as part of a California Air Resources Board program to reduce the emissions of commercial trucks in California. In accordance with the PCAF NA protocol, this example focuses on the consumer vehicle loans; commercial vehicle emissions are assumed to be included in the overall emissions of a business, based on its sector emissions. In this case, the loans would be to hundreds of sole proprietor trucking companies, and well-captured through trucking sector emissions. The consumer vehicle loan portfolio primarily includes cars, trucks, SUVs, and a small number of motorcycles, snowmobiles, ATVs, and RV trailers (without motors). Of the portfolio's 8,400 vehicles as of March 1, 2019, 0.6% are hybrids, 0.3% are plug-in hybrids, and 0.1% are EVs. There are no hydrogen vehicles in the portfolio.
Data Used	The following data were used for this case study: • Year, make, and model of the vehicles (82% of the portfolio) • Borrower address (State) • Loan dollars outstanding as of March 1, 2019 • US EPA data for fuel efficiency CO_2 in grams/mile for single- and duel-fuel vehicles, based on year, make, and model from the My MPG database • Average fuel efficiency from the US EPA database for loans with incomplete vehicle data • Average miles per capital driven in the US per state (2014 US Department of Transportation Federal Highway Administration data, complied by and accessed from CarInsurance.com) • US EPA combined utility factor (share of electricity) for plug-in hybrid EVs • Electricity consumption in kilowatt-hours/mile • Average Emission Factor (kg CO_2e/kWh) for borrower state from the US EPA Emissions and Generation Resource Integrated Database

Calculation and Results	Emissions for each vehicle were calculated as follows: Single fuel non-EVs: CO_2 in grams/mile for Vehicle x Average Miles Per Year for Borrower State = Emissions (kg CO_2e/year) An example calculation for a vehicle of unknown make, model, or year for a borrower in California would be calculated as follows: Average emissions of all vehicles in the US EPA database: 466.88 tailpipe grams CO_2/mile x Average miles driven per capita in California per CarInsuance.com: 14,425 miles = 6,739,000 grams CO_2 per year ÷ 1,000 = 6,739 kg CO_2 per year **Dual fuel vehicles:** (CO_2 in grams/mile for vehicle x average miles per year for borrower state x share of fuel 1 (non-electric)) + (CO_2 in grams/mile for vehicle x average miles per year for borrower state x share of fuel 2 (electric) x electricity consumption in kilowatt-hours / mile for the vehicle x grid emission factor (kg CO_2 / kWh for borrower address)) = Emissions (kg CO_2e per year) **EVs** Average miles per year for borrower state x electricity consumption in kWh / mile for the vehicle x grid emission factor (kg CO_2 / kWh) for borrower address **Absolute Emissions** Emissions for each vehicle were added to get the total absolute emissions for the entire portfolio **Relative Emissions** Total absolute emissions were divided by total loan dollars outstanding ($) to obtain total relative emissions (emissions per dollar) **Results** Total absolute emissions for Beneficial State Bank Consumer Vehicle Loan Portfolio as of March 1, 2019: 47.9 million kg CO_2e/year. Of this total, clean vehicles (hybrid, plug-in hybrid, and electric account for 1.1% of the portfolio and 0.49% of emissions). Total relative (per $) emissions for Beneficial State Bank Consumer Vehicle Loan Portfolio as of March 1, 2019: 0.615 kg CO_2e/year/dollar. The clean vehicle relative (per $) emissions are 0.25 kg CO_2e/year/dollar.

Regional Alignment

- The North American protocol will be the same for Canada and the US.

2.9 Next Steps

The methodologies described in this report address the major asset classes of the contributing authors' portfolios. As more financial institutions join PCAF NA, the North American methodology will be expanded in terms of asset classes covered and the specific investments within each asset class. As new public data becomes available or as existing data are updated, the methodology will note those sources as well. PCAF aims to create a global accounting methodology that has the potential to become a new GHG accounting standard for loans and investments.

> *"Sustainable finance is one of the fastest-growing workstreams we have ever seen at the Institute of International Finance. Helping the financial services industry find alignment on ways to understand, measure and report climate-related risks—and opportunities—is a big part of our work. Impact measurement, target setting, risk management, transparency and accountability are all key building blocks. In this context we welcome the launch of the global Partnership for Carbon Accounting Financials (PCAF) and the work done by the PCAF participants in North America over the past year. By measuring the emissions impact of loans and investments, financial institutions gain greater insights into their portfolios and can more effectively manage risk and create impact. PCAF thus provides a useful methodology and tools to help foster transparency and accountability—all of which supports greater financial stability and the transition towards a low-carbon economy."*
>
> **Sonja Gibbs**, Managing Director and Head of Sustainable Finance, Global Policy Initiatives at the Institute of International Finance

3. **Glossary**

Absolute emissions	Emissions attributed to a financial institution's lending and investing activity. Expressed in tonnes CO_2e.
Avoided emissions	Emission reductions that the financed project produces versus what would have been emitted in the absence of the project (the baseline emissions).
CO_2-equivalent (CO_2e)	The amount of CO_2 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 NA recommends using 100-year Global Warming Potentials without climate-carbon feedback from the most recent IPCC Assessment report.
Corporate debt	The debt owed by a corporate entity
Direct emissions	Emissions from sources that are owned or controlled by the reporting entity and/or the borrower or investee.
Double counting	Occurs when a single GHG emission reduction or removal, achieved through a mechanism issuing units, is counted more than once toward attaining mitigation pledges or financial pledges for the purpose of mitigating climate change.
Emissions scopes	The GHG Protocol Corporate 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.
Indirect emissions	Emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity.
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." This is in contradiction to the narrower definition sometimes used within, for example, a bank: "As one of several financing options besides, for example, debt finance and equity finance." 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.
Project finance	The long-term financing of infrastructure and industrial projects, this GHG accounting methodology covers only energy-related project finance.
Relative or intensity-based emissions: per invested value	Emissions attributed to a financial institution (absolute emissions) normalized for the amount lent or invested. Expressed in tonnes CO_2e / $ millions invested.
Tonne	Metric ton

4. Sources

The following publicly available sources are used to calculate emissions for the motor vehicle, mortgage, CRE, and business loan asset classes. These sources should be used if actual energy consumption or emissions data are unavailable.

Asset class	Information	Organization	Source
Motor vehicles	Auto usage US	CarInsurance.com	https://www.carinsurance.com/Articles/average-miles-driven-per-year-by-state.aspx
Motor vehicles	Auto usage Canada	NRCAN	http://oee.nrcan.gc.ca/publications/statistics/cvs08/appendix-1.cfm?graph=6&attr=0
Motor vehicles	Motorcycle usage	US Environmental Protection Agency	https://www.fhwa.dot.gov/policyinformation/statistics/2016/vm1.cfm
Motor vehicles	Auto fuel economy database by make and model	US Environmental Protection Agency	https://www.fueleconomy.gov/feg/ws/index.shtml#ympgVehicle
Motor vehicles	Off-road motorcycles; highway motorcycles; ATVs; snowmobiles; boats (marine spark ignition); and RVs database by make and model	US Environmental Protection Agency	https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment
Mortgage	Energy use intensity by east coast (north and central) census divisions	US Energy Information Administration	https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce1.2.pdf
Mortgage	Energy use intensity by central (east and west) census divisions	US Energy Information Administration	https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce1.3.pdf
Mortgage	Energy use intensity by southern census divisions	US Energy Information Administration	https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce1.4.pdf
Mortgage	Energy use intensity by west coast census divisions	US Energy Information Administration	https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce1.5.pdf
Mortgage	Energy consumption by province and home type; number of households by building type and province	NRCAN	http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends_res_ca.cfm
Mortgage	Building square footage by province and home type	NRCAN	http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive_tables/list.cfm
Mortgage	Energy consumption split by fuel type	US Energy Information Administration	https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce2.1.pdf

Asset class	Information	Organization	Source
Commercial real estate	Energy consumption by building activity and per square foot for the US	US Energy Information Administration	https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/c4.php
Commercial real estate	Energy consumption by building activity and per square foot broken out by census division (I)	US Energy Information Administration	https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/c7.php
Commercial real estate	Energy consumption by building activity and per square foot broken out by census division (II)	US Energy Information Administration	https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/c8.php
Commercial real estate	Energy consumption by building activity and per square foot broken out by census division (II)	US Energy Information Administration	https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/c9.php
Commercial real estate	Number of buildings by building activity and census region	US Energy Information Administration	https://www.eia.gov/consumption/commercial/data/2012/bc/pdf/b4.pdf
Commercial real estate	Energy consumption by building activity and square footage	NRCAN	http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SC&sector=aaa&juris=ca&rn=1&page=1
Commercial real estate	Energy consumption split by fuel type	US Energy Information Administration	https://www.eia.gov/consumption/commercial/data/2012/c&e/pdf/c1.pdf
Business loans	EXIOBASE with scope 1, 2, and 3 emissions for industry sectors and subsectors per unit of revenue	Navigant	Database will be shared by Navigant.
Business loans	Asset turnover by industry and sector	CSIMarket	https://csimarket.com/Industry/industry_Efficiency.php?s=400

5. **Appendix**

Following information should be included when reporting the GHG emissions impact of loans and investments:

- The scope of loans and investments covered by the methodology (note any limitations or exclusions)
- The methodology, calculations, timeframe, and data sources used
- Scope 1 and 2 emissions (from the perspective of the investee) of investments
- Scope 3 emissions where recommended by the methodology
- Optional: Avoided emissions (note that avoided emissions should not be subtracted from scope 1, 2, or 3 emissions since they do not negate those emissions)

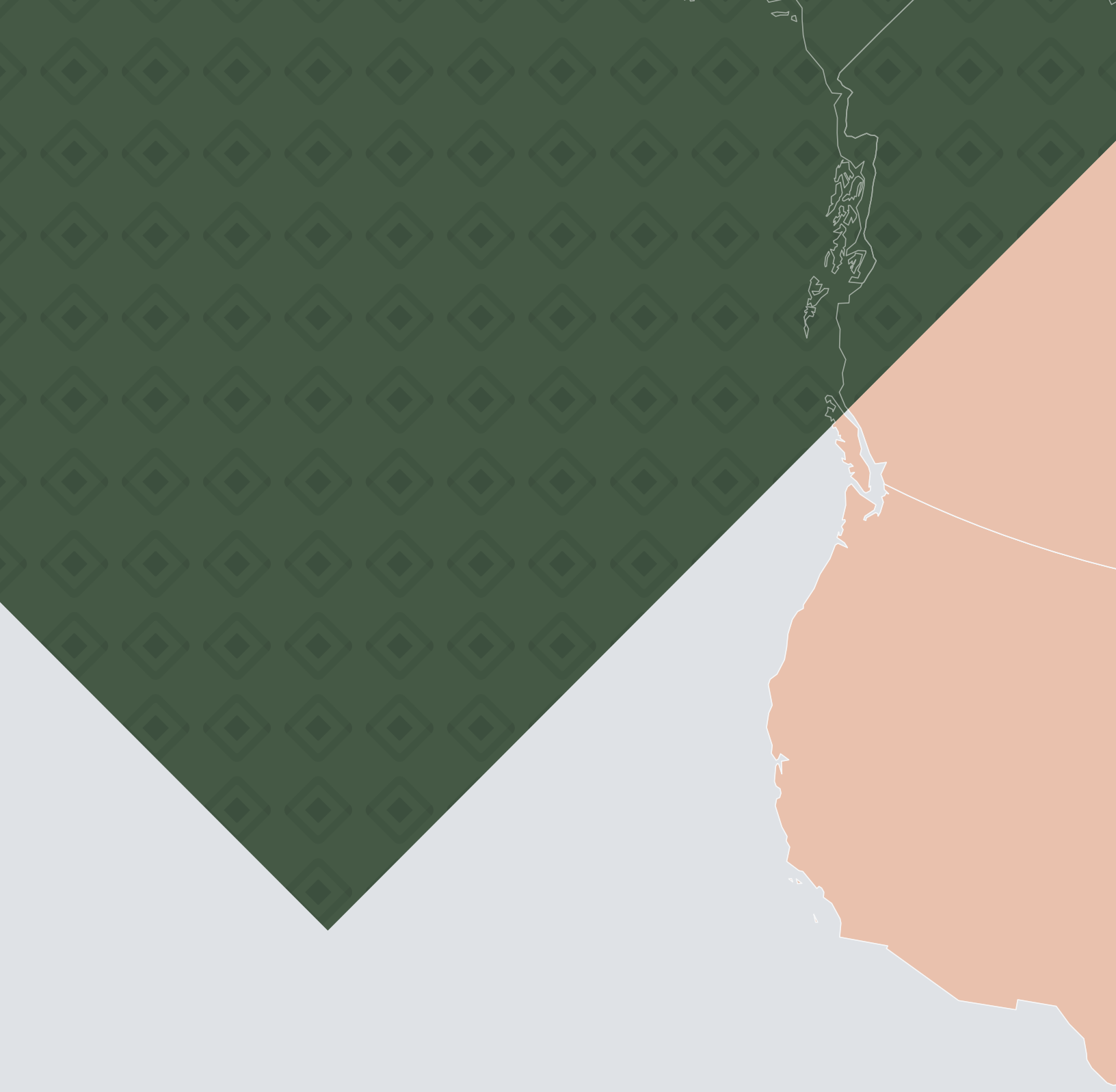
For further sustainability reporting guidance, please see the Global Reporting Initiative standard.[38]

The following table includes examples of how to report emissions (e.g., in the company's annual report, sustainability report, or website).

Table 1 Sample Table Template Displaying Emissions Impact in a Given Fiscal Year

Impact sector	Total Outstanding Loan and Investments Covered (x$1,000)	Emissions (tCO_2e)	Emissions Intensity (tCO_2e/$ million)	Data Quality Score High Quality = 1 Low Quality = 5
Generated emissions				
Asset class 1				
Asset class 2				
Asset class 3				
Total emissions				
Avoided emissions (the emissions will be a negative number)				
Project 1				
Project 2				
Avoided emissions total				

[38] GRI, "About Sustainability Reporting," https://www.globalreporting.org/information/sustainability-reporting/Pages/default.aspx.



PCAF

Partnership for
Carbon Accounting
Financials