Financed Emissions – Methodologies and Implication for Global Financial Institutions

By

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Abstract

Financed Emissions is the process of analyzing the environmental impact of lending and investment decisions in the portfolio of financial institutions. Financed Emissions analysis is essential to Scope 3 emission disclosures since the core business of most financial institutions relates to disbursing loans and other market-making activities. As financial institutions worldwide grapple with aligning their portfolios with the Paris Accord and increasing scrutiny by investors to improve ESG disclosure, the topic of Financed Emissions is gaining prominence. The thesis involved researching GHG calculation methodologies for different sectors and asset classes, compiling a concise outline of relevant case studies and recommendations for assessing financed emissions. The thesis is a highly qualitative state-of-the-art study on financed emissions that approaches the topic mainly from an academic standpoint tailored specifically to help practitioners understand the universe of existing methodologies and crucial strategic and operational considerations bordering financed emissions.

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Glossary of Terms

2Dii: 2 Degrees investing initiative

AFD: Agence Française de Développement

AuM: Asset under Management

B2DS: Beyond 2°C Scenario

CDP: Climate Disclosure Project

CRE: Commercial Real Estate

CTI: Carbon Tracker Initiative

EEIO: Environmentally Extended Input-Output

EPC: Energy Performance Certificates

ESG: Environmental and Social Governance

ETP: Energy Technology Perspectives

EVIC: Enterprise Value Including Cash

GFANZ: Glasgow Financial Alliance for Net Zero

GHG: Green House Gas

IBAC: Inrate Business Activity Classification

IEA: International Energy Agency

IMO: International Maritime Organization

ISO: International Organization for Standardization

MPG: Miles per Gallon

NAICS: North American Industry Classification System

NGO: Non-Governmental Organizations

NHTSA: National Highway Traffic Safety Administration

NZE: Net Zero Economy

OCC: Office of the Comptroller of the Currency

OECD: Organization for Economic Co-operation and Development

PACTA: The Paris Agreement Capital Transition Assessment

PCAF: Partnership for Carbon Accounting Financials

PRI: Principles for Responsible Investing

RMI: Rocky Mountain Institute

SBTI: Science-Based Targets

SDA: Sector Decarbonization Approach

SEC: Securities and Exchange Commission

TCFD: Task Force on Climate-Related Financial Disclosures

TEG: European Union Technical Expert Group on Sustainable Finance

TPI: Transition Pathway Initiative

U.N.: United Nations

UNCTAD: United Nations Conference on Trade and Development

UNEP FI: United Nations Environment Programme Finance Initiative

WACI: Weighted Average Carbon Intensity

WBCSD: World Business Council for Sustainable Development

WLTP: Worldwide Harmonized Light Vehicle Test Procedure

WRI: World Resource Institute

Executive Summary

Background

The Center for Energy, Development, and the Global Environment (EDGE) at Duke University's Fuqua School of Business is a dynamic hub for education, thought leadership, and industry engagement that enables current and future business leaders to understand and respond effectively to the interrelated global challenges of energy, development, and the environment. Staying true to a mission to drive thought leadership, the Center initiated the EDGE Fellowship Program to have students conduct cutting-edge research that impacts society. Inspired by my role as an EDGE Fellow and building on work done as a 2020 EDF Climate Corps Fellow at Bank of America, I explored the topic of Financed Emissions. The study aims to educate readers on the implications for banks regarding how financed emissions are managed and crucial strategic and operational considerations for banks and practitioners.

Motivation and Significance of the Study

The rise of ESG and investor interest in the climatic impact of financial institutions highlights the importance and urgency of measuring financed emissions needed for portfolio alignment towards net-zero emissions. Financial institutions that measure financed emissions can understand the impact of their lending and investment activities on the climate, identify connected physical, transition, and liability risks and opportunities, and transparently report their progress to stakeholders. Fundamental and relevant literature about financed emissions is sparse. Additionally, finding materials on financed emissions with a standard and single knowledge of truth proves difficult hence justifying the contribution of this thesis to existing literature.

Methods

The research involved reviewing historical methods for assessing financed emissions assessing GHG calculation methodologies for different sectors and asset classes with a final goal of distilling the globally accepted carbon accounting method under the Partnership of Carbon Accounting Financials (PCAF).

Subsequently, I compiled a concise outline of relevant case studies and recommendations for assessing financed emissions. Lastly, by leveraging my industry and expertise, I proffered recommendations to financial institutions on steps to take assessment and considerations post-assessment.

Observations

Existing methodologies are helping to move the needle to improve climate disclosure; however, there are significant weaknesses that must be overcome to achieve comparability amongst players in the industry. The most difficult challenges on the horizon of financed emissions will relate to enhancing the existing methodologies of assessment and building credibility around reported figures. Regulatory oversight might be required on financed emissions since the information is powerful enough to alter investment decisions, which will place companies and banks under intense scrutiny.

Discussion and Conclusion

There is a need for stronger partnerships between financial institutions and academia to understand how to apply existing methodologies and overcome limitations and gaps in the standards while building a more robust infrastructure for assessments to feed into climate models. This thesis set out to take a deep dive into a qualitative study on financed emissions and achieved that goal; however, there are quantitative areas that are just as important. Therefore, with more collaboration with academia, especially on data sharing, the financial sector can move the needle towards climate alignment. I hope that as time passes, academia will drive groundbreaking empirical research into financed emissions backed with observable and factual data provided by financial institutions.

CHAPTER 1 - Introduction

1.1. Introduction and Definition of Financed Emissions

As financial institutions worldwide grapple with aligning their portfolios with the Paris Accord and increasing scrutiny by investors to improve ESG disclosure, the topic of Financed Emissions is gaining prominence. Financed Emissions is the process of analyzing the environmental impact of lending and investment decisions in the portfolio of financial institutions. Financed Emissions analysis is essential to Scope 3 emission disclosures since the core business of most financial institutions relates to disbursing loans and other market-making activities.

Growing interest in Environmental Social and Governance (ESG) risk and performance by stakeholders in the financial system such as institutional investors, customers, employees, insurance companies, and even financial regulatory bodies are advancing topics like responsible investing and financed emissions to the forefront of the conversation. Financial institutions posed with these questions often adopt both passive and active strategies geared towards divestment, responsible investing, and engagement. Today, one of every three dollars of assets under management is influenced by ESG considerations.[1] The rising interest highlights the need for ESG data, tools, and analytics needed for making decisions; however, inconsistency in all these areas impedes ESG practices from reaching their full potential and does not arm stakeholders with the tools to make informed decisions about their investment and engagement with banks. Financial institutions have often been accused of greenwashing, ranging from marketing practices to touting green initiatives that somehow cancel out conventional carbon-burning investments.[2] These institutions are often called to order by civil society organizations such as Rainforest Alliance in its annual "Banking on Climate Chaos" report, which shows how the sustainable investing initiative of the

[1] Stevens, Jason (2021, November 21). The rise of ESG and the importance of ESG Data. Nasdaq. Retrieved February 4, 2022

[2] Yablon, A. (2021, February 22). Banks are greenwashing themselves. don't believe it. VICE. Retrieved February 11, 2022

world's leading financial institutions pales in comparison to direct financing of the fossil fuel industry.[3] Clearly, there is an apparent discrepancy between words and actions; however, the mechanisms to address the shortcomings of these organizations are lacking, which is why understanding the topic of financed emissions is crucial.

For every organization, there are three categories of emissions scope 1, scope 2, and scope 3 (See Section 1.4 for detailed explanation); the CDP estimates that "*on average companies report having supply chain greenhouse gas emissions that are 5.5 times greater than their own direct impact from scope 1 and 2 emissions*". [4] However, this ratio varies between sectors, but the CDP estimates the ratio is at least 5.9 times for the service sector and will probably be heightened for financial institutions when they can genuinely be analyzed in the future as maturity in assessing financed emissions improves.

1.2. Brief History on Financed Emissions

The universe of financed emissions is sparse, and this has been the case for several decades before now. Before creating a global carbon accounting standard for financial institutions, think tanks and academics researched and developed diverse assessment methodologies. For example, in 2006, Trucost, an environmental market intelligence platform, developed a carbon footprint methodology for assessing equity portfolios using company-specific data and Environmentally Extended Input-Output (EEIO) models when company data was not available. Bank of America in 2012 developed a mathematical approach to extrapolate reported financed emissions data to non-reporting listed companies now being sold under the Camradata platform. Credit-Agricole-CIB leveraged the research of academic Antoine Rose to develop P9XCA, a top-down approach for quantifying financed emissions where financial players allocate all GHG emissions to sources of finance. These efforts were made independently and often tailored towards the needs of the financial institution engaging in the efforts. Additionally, collaboration,

[3] Rain Forest Alliance, Banking on Climate Chaos, March 2021
[4] Carbon Trust, CDP Supply Chain Report 2018/19, CDP, 2019

disclosure, and comfort to make methodologies and results open were lacking amongst financial institutions. Given the challenges faced by the sector in making advancements in financed emissions, organizations such as United Nations Environment Programme Finance Initiative (UNEP FI) and World Resource Institute (WRI) stepped up to engage stakeholders to develop a methodology to aid in assessing financed emissions.

In December 2012, UNEP FI and Green House Gas (GHG) Protocol (developed by WRI) began scoping workshops to guide the financial sector. Interested stakeholders were invited to participate in online surveys to gauge content in new guidelines for financed emissions. Subsequently, other workshops were conducted to lay out the business case for accounting and reporting financed emissions and gather insights on existing practices, challenges, and recommendations for assets classes to be covered in a new guideline. [5] [6] Guidelines were proposed for three main financial activities, investing, lending, and advisory services discussed below:

- **Lending** – Participants agreed that it was essential to include guidance on lending activities within any GHG accounting guidelines. Some business cases for measuring financed emissions from lending activities include its importance in developing a GHG management strategy, helping to understand portfolio efficiency, improving transparency, and responding to growing investor interests. Another crucial objective of standardized guidance was to promote consistency amongst peers. Another exciting consideration discussed was the prioritization of financial instruments, and they agreed that project finance and corporate loans in high-impact sectors such as utilities. Some challenges foreseen by industry experts included boundary setting in terms of the scope of the emissions to be accounted for, using a top-down or bottom-up approach for assessment, data quality, and availability, and effectively allocating emissions for syndicated deals, amongst other issues.

[5] GHG Protocol and UNEP FI, Guidance for the financial sector: Scope 3 accounting and reporting of greenhouse gas emissions, Feb 2013

[6] GHG Protocol and UNEP FI, Financed Emissions Initiative: Greenhouse gas accounting guidance and greenhouse gas risk management guidance for financial intermediaries, May 2013

- **Investing** – the broad consensus by the group was that investing activities should be explored in more detail and made no significant conclusions. However, stakeholders acknowledged that asset managers were crucial for any guidance crafted on managing financed emissions from investment portfolios. Overall, the business case for pursuing this effort was helpful in risk management and investment decision-making, which often seem to be guided by existing ESG policies by some organizations.
- **Advisory Services** - there was a weak consensus regarding advisory services because of the weak link between the activity causing the emissions and the bank's service that enables that activity. Stakeholders also agreed that including guidance for advisory services could be potentially complex. The group also discussed financial services such as trading and brokerage, insurance and credit guarantees, and underwriting. Some technical challenges discussed include assessing financed emissions for advisory services, including accounting for multiple transactions within a reporting period, secondary offerings, and allocation among different parties.

After several workshops and scoping sessions with industry experts, the GHG protocol and UNEP FI embedded the learnings into a report published in 2013 called *Technical Guidance for Calculating Scope 3 Emissions.*[7] UNEP FI and WRI continued to gather stakeholders to develop and release a guidance document specifically for the financial sector with a proposed due date of 2016. Still, this effort was never fully realized, and reasons remain unknown. [8] [9] While the UNEP FI and GHG Protocol process to develop guidance was stakeholder-driven, participating institutions and other banks probably struggled to operationalize the ideas discussed.

[7] World Resources Institute, WBCSD, Technical Guidance for Calculating Scope 3 Emissions, 2013
[8] GHG Protocol and UNEP FI, Financed Emissions Initiative - Technical Working Group on Greenhouse Gas Risk Management Project Overview.
[9] GHG Protocol and UNEP FI, Financed Emissions Initiative - Landscape Review of Alternate Climate Metrics, Sept 24, 2014

In 2015, the Partnership for Carbon Accounting Financials (PCAF), an organization founded by some Dutch Financial Institutions and funded by the Hewlett Foundation, set out to:[10] "

- *Develop a global carbon accounting standard for financed emissions (the Platform for Carbon Accounting Financials, or PCAF).*
- *Increase the number of banks that commit to measure and disclose the carbon emissions of their loans and investments, ultimately aligning their portfolio with the Paris Agreement; and*
- *Provide technical assistance to the participating institutions to adapt the global Standard to the regional context and implement carbon accounting within their firms."*

PCAF galvanized efforts to create the first globally accepted carbon accounting standard for financed emissions, launching in North America in 2018, publishing two reports on GHG accounting methods, launching PCAF globally in 2019, and finally releasing the Global GHG Accounting and Reporting Standard for the Financial Industry in 2020. [11] [12] [13]

The Standard developed by PCAF remains the most widely accepted carbon accounting standard amongst global financial institutions; however, other approaches developed by other banks still exist as this body of work develops. The landscape of methodologies is discussed in detail in Chapter 2.

It is also important to acknowledge the role of other actors in advancing work on financed emissions, organizations such as U.N. Principles for Responsible Investing (PRI), Net-Zero Asset Owner Alliance, Net Zero Asset Managers, Net-Zero Banking Alliance, the Glasgow Financial Alliance for Net Zero (GFANZ) amongst others all work towards Aligning portfolios towards pushing members to align towards net-zero financed emissions while supporting corporate transition financing needs of investees. Additionally, organizations such as Science Based Targets (SBTi), Transition Pathway Initiative (TPI),

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[10] Hewlett Foundation. (2022, January 26). Amalgamated Foundation - for the platform for Carbon Accounting Financials (PCAF) project. Retrieved February 11, 2022

[11] Giel Linthorst, & Mark Schenkel, (2018), Harmonizing and implementing a carbon accounting approach for the financial sector, November 2018, PCAF; Navigant

[12] Giel Linthorst, Mark Schenkel et al, (2019), Harmonizing and implementing a carbon accounting approach for the financial sector in North America, October 2019, PCAF North America; Navigant

[13] PCAF, The Global GHG Accounting and Reporting Standard for the Financial Industry, 2020

and International Energy Agency (IEA) work to push boundaries with results from financed emissions to make them more decision-useful for financial institutions. At the same time, organizations like the Rocky Mountain Institute (RMI) Center for Climate Aligned Finance seek to drive climate alignment in highly carbon-intensive sectors while developing tools to help financial institutions understand the impact of hard to crack sectors such as shipping through the creation of the Poseidon Principles.

1.3. Financed Emissions from a Greenhouse Gas Protocol Perspective

Before now, financial institutions grappled with overcoming two significant barriers when assessing financed emissions: first, the unavailability of a globally accepted standard for measuring and disclosing financed emissions; and second, the lack of availability of emissions data to support financed emissions analysis. However, before the advent of the Partnership of Carbon Accounting Foundation, industry experts spent several years developing a standard. These efforts were primarily driven by the Greenhouse Gas Protocol and U.N. Environment Programme Finance Initiative (UNEP FI).

(WRI, 2013) Financed emissions from the perspective of the GHG Protocol is the crucial foundation upon which various methodologies have been developed. Under the GHG Protocol, financed emissions are defined under category 15 of scope 3 emissions – "Investments." These scope 3 emissions are with a financial institution's reported yearly emissions that are not included in scope 1 or 2. Investments as defined by the GHG Protocol apply to companies that make investments, companies that provide financial services, and investors that are not profit-driven, such as multilateral development banks. In some instances, a firm's organizational boundaries will determine whether financed emissions are reported within scopes 1 or 2. For example, a firm adopting an equity-share approach will include emissions from equity investments within scope 1 and scope 2. Firms using a control approach will account only for equity investments within their control in scope 1 and 2.

The GHG Protocol provides guidelines for assessing financed emissions, covering four main asset classes: Equity, Debt, Project Finance, and investment advisory services. The GHG Protocol recommends that emissions from these assets be allocated to the reporting company (i.e., financial institution) based on

the reporting company's share within the investee. Firms are advised to choose a fixed point in time for assessment, such as December 31 of the reporting year, using a representative average over the reporting period.

In selecting a calculation method, firms may adopt any of the following approaches:

- Investment-specific method: based upon the share of investment, firms collect scope 1 and scope 2 emissions from the investee companies and allocate the emissions; or
- Project-specific method: based on the investor's proportional share of total project costs, i.e., total debt plus equity, firms gather scope 1 and scope 2 emissions for the relevant project(s) and allocate the emission; or
- Average-data method: like investment and project-specific except that proxy data such as Environmentally Extended Input-output (EEIO) data to estimate the scope 1 and scope 2 emissions from the investee company

1.4. Significance and Motivation of the Study

According to United Nations Environment Gap Report, it is estimated that required cuts in greenhouse gas emissions (GHG) must fall 7.6 percent per year from 2020 to 2030 for the 1.5°C goal and 2.7 percent per year for the 2°C goal to limit the physical impacts of climate change and meet the goals of the 2015 Paris Agreement.[14] Financial institutions play a crucial role in climate alignment because large-scale investments need to be mobilized towards climate mitigation and adaptation. This was recognized in Article 2 of the Paris Agreement, which includes "*making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development*."[15] According to a CDP report, The Time to Green Finance [16], the following findings are fundamental to understanding the current state and role of financial institutions in climate alignment:

[14] U.N. Environment Programme, Emissions Gap Report 2019
[15] United Nations Framework Convention on Climate Change (UNFCC), Paris Agreement, 2015
[16] CDP, The Time to Green Finance, CDP Financial Services Disclosure Report 2020

- 49% of financial institutions indicate they do not analyze how their portfolio impacts the climate at all.
- Only 25% of disclosing financial institutions with an Asset under Management (AuM) of $27 trillion report their financed emissions which were 700x larger than reported scope 1 and scope 2 emissions

The key findings above highlight the importance and urgency of measuring financed emissions needed for portfolio alignment towards net-zero emissions. Financial institutions that measure financed emissions can understand the impact of their lending and investment activities on the climate, identify connected physical, transition, and liability risks and opportunities, and transparently report their progress to stakeholders. For financial institutions seeking to achieve net-zero emissions, the process typically has four non-linear steps; the first step is measuring and disclosing financed emissions; secondly, using results from financed emissions assessment to help set meaningful and impactful science-based targets; thirdly, developing strategies to align their portfolio with set goals to reach targets and lastly taking needed action to achieve targets be it through divestment, responsible investing or engagement. Existing methods to assess financed emissions are highly complex and remain largely underdeveloped. It is understandable to see how cautious financial institutions are to release numbers that penalize them or even use preliminary figures to set ambitious climate action goals for their portfolios. Financial institutions face challenges: the lack of expertise or rigorous scientific background to evaluate various methods of assessing financed emissions— the data required to support analysis has also not been sufficiently developed. Instead, existing methods have been designed solely for use within specific financial institutions, making it difficult to adopt by other banks, the lack of openness to share operational challenges faced while sharing preliminary assessment, sparse availability, and complex distribution of company-specific data in various ESG data aggregating applications. These and many others are among the numerous challenges practitioners face in navigating the landscape of financed emissions. This thesis is a highly qualitative state-of-the-art study on financed emissions that approaches financed emissions mainly from an academic standpoint tailored specifically to help practitioners understand the universe of

existing methodologies and some potential challenges faced during implementation. By bringing together a single point of truth with relevant, existing, and up-to-date knowledge on financed emissions, practitioners can hope to understand the primary strengths and weaknesses of existing methodologies, especially the globally accepted carbon accounting standard developed by PCAF. Additionally, the thesis highlights the hiccups faced when operationalizing the PCAF Standard and discusses workarounds and relevant considerations post-assessment.

1.5. Thesis Organization

Chapter 1

This chapter gives a brief introduction to the thesis and history of financed emissions, including the significance and motivation of the thesis. It lays out the primary definition of financed emissions and provides a background and understanding from the perspective of the GHG Protocol regarding Scope 1, 2, and 3 emissions for financial institutions.

Chapter 2

Chapter 2 lays out a few recent works on financed emissions primarily from non-academic contributions before providing an overview of historical methods of assessing financed emissions. It lays out the primary approaches to assessing financed emissions and their comparisons and includes case studies on the real-world application of some of these existing methodologies obtained from an extensive review of published content on financed emissions.

Chapter 3

This chapter dives deeper into the globally accepted PCAF Standard and discusses all asset classes currently catered to in the Standard. It provides a quick summary for each asset class and covers

definitions, emission scopes, attribution methods, data requirements, and other considerations. This chapter also dives into the weaknesses of existing approaches to assessing these asset classes.

Chapter 4

Chapter 4 chronicles some operational and strategic considerations of assessing financed emissions using the PCAF Standard. Operational challenges relate to issues financial institutions can expect to face during the assessment, particularly around method data gathering, enterprise applications, and portfolio-specific sectors. Strategic considerations relate to subsequent steps taken after initial assessment and critical reporting and stakeholder engagement considerations. It also lays out workarounds to some of these challenges.

Chapter 5

Chapter 5 rounds up with closing thoughts on the existing financed emission assessment methods and highlights important areas of focus for practitioners and academia to improve the body of work.

CHAPTER 2 - Literature Review

Fundamental and relevant literature about financed emissions is sparse. Additionally, finding materials on financed emissions with a common and single knowledge of truth proves difficult hence justifying the contribution of this thesis to existing literature. Contribution to the body of work on financed emissions is mostly materials and concept notes created by environmental Non-Governmental Organizations (NGOs) and think tanks, case studies released by banks performing a preliminary assessment on their financed emissions, and a few academic papers. This literature section begins by discussing the various contributions of these players and the value they add to the expanded work on financed emissions in this thesis. Subsequently, various financed emission methodologies are introduced, primarily detailing the origination and objective of the methodology, potential weaknesses, and current adoption, if any, by financial institutions through case studies. The chapter concludes by discussing nascent methodologies for assessing hard to crack sectors such as shipping and agriculture.

The most outstanding contribution to earlier literary work on financed emission comes from publications developed by the environmental think tank 2 Degrees investing initiative (2Dii) and is highly recommended to professionals seeking to understand the lay of the land of financed emissions. 2Dii's 2013 publication, From Financed Emissions to Long-Term Investing Metric, 2Dii presented a review of existing GHG accounting approaches for the financial sector and established the case for developing financed emission methodologies and an outlook for how financed emissions methodologies can help in climate alignment. [17] In 2016, the organization followed up with another publication titled, *Climate Strategies and Metrics (?): Exploring Options for Institutional Investors*; the authors discuss investor strategies around climate-friendly activities, which typically covers positioning and signaling and assesses how these strategies can be applied to different asset classes and conclude by providing an update on the landscape of available climate metrics guided by ground-breaking work on financed emission

[17] 2 Degrees Investing Initiative. (2013). From Financed Emissions to Long-Term Investing Metrics: State of the Art Review of GHG Emissions Accounting for the Financial Sector.

methodologies for different asset classes and their suitability for each strategy. [18] 2Dii's publications contribute immensely to understanding early players in financed emission methodologies who mainly focused on project-based GHG accounting. In addition, 2Dii publications are critical in highlighting big picture ideas on financed emissions regarding investor objectives for assessment, climate alignment, sector-specific metrics, accounting for green investments or avoided emissions, and unavoidable weaknesses in assessment methodologies, e.g., double-counting locked-in emissions, etc.

There are two main approaches used in assessing financed emissions; the top-down approach and the bottom-up approach, which are distilled in **Section 3.1**. Assessing financed emissions from a 2Dii perspective is mainly geared towards a bottom-up approach that uses granular production and asset-level information for portfolios. Most methodologies adopt a bottom-up approach; therefore, the literary contribution of Antoine Rose is commendable due to her ideas on implementing the top-down approach. (Antoine Rose., 2014), in her Ph.D. dissertation, she studied various existing carbon accounting models. She proposed an analysis tool based on a new form of carbon accounting to allocate GHG emissions to "agents" [19] according to their ability to reduce them deemed as "accounting by issue." An example that may help understand the agent and issue phenomenon is the car manufacturing industry; in this industry, individual car manufacturers such as General Motors and Ford wield power to tackle issues that contribute to high-carbon production by changing car engines. The tool designed by Antoine used a top-down approach and allowed a sectoral and geographic mapping of "induced GHG emissions" by financing and investment portfolios (in debt and capital). The objective of any bank using the top-down approach is to map issues/emissions within an industry or geography to an agent in their portfolio. The

[18] 2 Degrees Investing Initiative, WRI, UNEP-FI (2016) "Climate Strategies and Metric: Exploring Options for Institutional Investors.

[19] Agents in this context is a producer of high-carbon goods who wields the power to decrease emissions through product and process innovation

proposed model, also known as P9XCA, was adopted by some European banks and discussed more in this chapter's subsequent sections. [20]

Prior discussions have focused on strides made in Europe and North America; therefore, to form a holistic picture of global efforts, it is important to highlight academic contributions from Africa. (Bimha, A., & Nhamo, G., 2013), studied nine South African banks to present a desirable strategy of measuring their internal and external carbon emissions operations. The authors' found that most banks who used the GHG Protocol to carbon footprint their activities had a detailed carbon footprint of their internal operations. However, only four banks had a system to measure financed emissions and, to a lesser extent, financed emissions of their products.[21] Financial institutions have not made a significant contribution or efforts on the African continent regarding financed emissions. Most existing efforts focus on project-based GHG typically needed to approve large-scale investments in infrastructure projects. Additionally, the lack of ESG data on companies operating on the continent poses a solid challenge for African financial institutions that decide to assess their portfolio. PCAF's effort on global adoption has invigorated a new drive for assessing financed emissions by African banks. Banks such as Access Bank, First Rand Group, Investec, amongst others, have committed to measure and disclose the carbon footprint of their loans and investments. However, these banks only represent 0.39% of total global financial assets committed as of January 2022.

Financial institutions in developed countries have the resources to devote to research and development of tools to assess financed emissions and push boundaries to create methodologies to assess hard to crack sectors, which are discussed in the latter sections of this chapter. Relevant contributions include, (Teubler, J., & Kühlert, M.,2020) where the researchers account for scope 3 greenhouse gas (GHG) emissions of

[20] Antoine Rose. Accounting for greenhouse gas emissions by issue: a tool for analyzing the impacts of climate change on the activities of a corporate and investment bank. Savings and finances. Paris Dauphine University - Paris IX, 2014.
[21] Bimha, A., & Nhamo, G. (2013). Conceptual framework for carbon footprinting in the South African banking sector. Banks & bank systems, (8, Iss. 4), 19-33.

GLS Bank's [22] financial and investment portfolios where neither accounting data (balance or value-added) of loan recipients nor any physical data was available.[23] Drawing from the PCAF Standard, the authors analyzed GLS Bank's portfolio, including loans spanning renewable energies, sustainable business, nutrition, housing, education & culture, social welfare & health, and other assets such as Climate Funds and shareholdings for renewable energy subsidiary companies. They also discuss how modeling can help estimate the environmental impact and the limitations of using such an approach, and how to reduce it. These efforts uncover workarounds that could be adopted by financial institutions when data is unavailable and will be helpful when discussing ways to operationalize assessing financed emissions in **Chapter 4**.

Additionally, UNEP FI has remained committed to improving the knowledge of financed emissions within the financial sector. UNEP FI's publication by (Weber, C., Thomas, et al., 2018) used a recommended scope of relevant banking activities across 35 large banks to review the existing landscape of climate progress metrics for banks and assess the relative merits of different metrics. The review found three main categories of metrics; GHG accounting approaches that covered project carbon accounting and financed emissions, sector-specific Energy and carbon metrics, and exposure-based green and brown metrics. [24]

Since the PCAF methodology gained prominence in 2020, professionals in the field have questioned how financed emissions fit within the framework for existing ESG standards and reports. To understand that better, organizations such as Vivid economics released a publication that lays out the current international gold Standard for measuring financed emissions, i.e., the PCAF standard and its importance for climate

[22] GLS Bank is one of the first banks in Germany with a social-ecological business model
[23] Teubler, J., & Kühlert, M. (2020). Financial carbon footprint: calculating banks' scope 3 emissions of assets and loans.
[24] Weber, C., Thoma, J., Dupre, S., Fischer, R., Cummis, C., & Patel, S. (2018). Exploring metrics to measure the climate progress of banks. UNEP Finance Initiative.

portfolio alignment and a selective indication of the progress of some financial institutions in assessing their portfolios and setting net-zero targets. [25]

In the same vein, the topic of financed emissions has also found a way to permeate into conversations by government and regulatory bodies in the United States, mainly where climate change, social responsibility, and climate disclosures are discussed. In Andy Green's testimony before the U.S. House of Representatives Committee on Financial Services, he summarizes recommendations for action by the Securities and Exchange Commission (SEC) and other U.S. financial regulators on systemic climate risk, including disclosure, and on other ESG topics, including workers and inequality, race and gender, tax transparency, human rights, and democracy protection. Regarding financed emissions, Green draws attention to lawmakers on the importance of financial institutions assessing financed emissions due to its ability to enable investors and lenders to allocate capital more effectively in the long term and align the financial system towards net-zero emissions by 2050. He also provided use cases for financed emissions by securities regulators, such as improving credit rating and supporting vigorous audits, amongst others. Additionally, Green highlights the value that financed emissions could offer housing and agricultural finance regulators in reducing taxpayer risks by assessing the emissions of originating banks and their affiliates. Lastly, Green makes an exciting connection that financed emissions could improve racial equity when issuers of credit are held accountable for their local actions or climate risks they create. [26]

2.1. Overview of Carbon Accounting Methodologies

Over a dozen financed emissions methodologies exist today, covering almost all asset classes. This chapter highlights twelve relevant and applicable methodologies of financed emissions obtained through a rigorous review of publications. Most financed emissions methodologies existed before developing the international and globally accepted gold Standard for assessing financed emissions (i.e., PCAF Standard).

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[25] Vivid Economics, Climate-related disclosures for financial institutions, September 2021
[26] Green, A. (2021). Aligning the Financial System and Capital Markets with Long-Term Economic and Public Interest Outcomes.

More standards are being developed and improved upon by private sector players and environmental think tanks.

Most financed emissions methodologies utilize a proportional approach where client emissions are attributed to the financial institution based on the money offered to the client. Above all, the methodologies typically align with international guidelines or protocols on carbon accounting, such as GHG Protocol, ISO14065, and PAS2050. Various finance emissions methodologies apply a mix of these standards and approaches depending on the scope and asset type. Financial institutions are advised to be guided by what is intended to be measured when choosing a financed emissions methodology. It is often highly dependent on the interests and objectives of the organization.

Before delving into these methodologies, it is vital to understand the two main approaches to consolidating financed emissions: the top-down and bottom-up approaches.

- The 'top-down' approach is used to speed up assessing portfolios with too many product lines. It fills the gaps, especially when a long investment chain hinders the tracking of the destination of some asset lines (e.g., shares in mutual funds). The approach relies on using 'secondary' or 'average' emission factors based on industry, geography, and other specific characteristics and directly applies them to the outstanding amount held by the investor. This approach has been used by Cross Asset-Footprint (AFD), P9XCA-(Credit-Agricole), and Ecofys (ASN Bank).
- The 'bottom-up' approach aligns with traditional carbon accounting and is based on the consolidation of company-specific reported emissions, calculated or estimated for each investee financed. Financial institutions typically use data processing methods to match these emissions to unique obligors within internal systems. Some methodologies adopting this approach include South-Pole-Carbon, Trucost, and Partnership for Carbon Accounting Financials (PCAF).

A few of these crucial methodologies are reviewed in subsequent sections of this report, highlighting industry application through case studies.

2.2. Trucost Model

Trucost uses a bottom-up approach of calculating financed emissions associated with a broad range of banks' loan books. In 2006, the company conducted its first carbon footprint for Henderson Global Investors' equity portfolio. Trucost has one of the world's largest databases of corporate carbon emissions, covering 14,500 entities worldwide, representing 99% of global market capitalization. Trucost standardizes and validates the data to help ensure quality and consistency. Trucost estimates Scope 1 and Scope 2 emissions when company-specific data is unavailable using an Environmentally Extended Input-Output (EEIO) model and the multisector North American Industry Classification System (NAICS) approach. Trucost's proprietary model is based on the United States Bureau of Economic Analysis Input-Output [27] accounts and extends to 500 unique industry sectors to enable more detailed analysis.[28] Each NAICS sector has a carbon intensity in terms of quantity of GHG per dollar of sales attributed based on the EEIO model. Companies' revenues are broken down based on the 464 NAICS sector. At the company level, carbon emissions estimated are the weighted average carbon intensity given by the EEIO and the breakdown of turnover by NAICS sectors.

2.3. Climate Impact Model (Inrate)

Established in 1990, Inrate is an ESG rating agency that developed the Inrate Climate Impact Model that provides GHG emissions (in tCO2eq) and GHG intensities (in tCO2eq/mUSD) for about 3,200 companies, various indices as well as climate impact analyses for investment portfolios.[29] Since then, they have sold financed emissions data to complement ESG data to their clients (asset managers, financial analysts). Inrate uses model-based estimations to calculate scope 1, 2, and 3 GHG footprints and intensities of companies. (Dr. Bettina Schäppi, 2019), *The model applies 119 GHG intensities in tonnes of*

[27] Input-output analysis is an economic model that quantifies in monetary terms the flow of goods and services between all sectors of the economy.
[28] Trucost, Trucost Environmental Data – Private Companies, Methodology Guide. (S&P Global). 2021
[29] Schäppi B et. al, Inrate Climate Impact Methodology, May 2020

CO2 equivalents per revenue in USD for approximately 330 economic activities of the Inrate Business Activity Classification (IBAC). The model embeds GHG intensities from a U.S. statistical model enhanced with lifecycle data to cover the sold products emissions of the investees. In carbon-intensive sectors such as energy and utilities, Inrate supplements the EEIO with values based on bottom-up research on annual energy and fossil fuel production volumes and scientifically based emission intensities. Inrate also calculates a Weighted Average Carbon Intensity (WACI) to compare scope 1,2 and 3 emissions across various portfolios.

2.4. Cross-Asset Footprint® Model (MFS/ AFD)

It was developed in 2012 for Agence Française de Développement (AFD) by a start-up company called Money Footprint Software; the model combines bottom-up and top-down approaches to cater to all listed non-financial companies and financial institutions (including financed emissions), loans to SMEs or households, sovereign bonds, for cradle-to-cradle emissions, mortgages, and green projects.[30]. Based on the Inrate model and the Caisse d'Epargne methodology, the tool uses a project or activity's operational data to estimate GHG emissions. It performs carbon footprint calculation by inventorying a project's activities using physical data inputs. Using a scientifically determined "emission factor," the tool computes each item's emissions based on inputted quantities.' It instantly converts each physical value into its CO2eq using kilograms or metric tons as a unit of measure.

2.5. P9XCA Methodology (Finance Sustainability Chair / Credit-Agricole-CIB)

In 2011, Antoine Rose, a Ph.D. student, developed the P9XCA in partnership with the Paris-based Sustainability Chair for Crédit Agricole CIB. The methodology primarily seeks to avoid double-counting and provide an order of magnitude for a bank's financed emissions instead of comparing clients' environmental footprint or industry allocation. The methodology adopts a top-down approach for quantifying financed emissions where financial players allocate all GHG emissions to sources of finance

[30] Ibid

such as debts bonds based on their market share by economic sector and geographical zone. The basic principles sought when designing the methodology were ease of use due to the limited availability of emissions records for corporate clients and public open-source emission factors, transparency, and avoiding double-counting financed emissions. The methodology is based exclusively on open-access public statistics, e.g., national GHG inventories, public accounts from U.N., and Organization for Economic Co-operation and Development (OECD).

2.6. South Pole Carbon's Model

South Pole developed a mathematical model that extrapolates reported carbon data to provide carbon footprints for listed companies. The data has been available on Bloomberg terminals since 2012. The methodology can also calculate GHG footprints of private equity portfolios in partnership with ESG Analytics. The company has gone on to establish various climate assessment tools for corporate bonds, real estate, private equity, infrastructure as well as direct investments into forestry and agriculture assets

2.7. Carbon Screener® Model (Bank of America / Camradata)

In 2012, Bank of America developed a mathematical approach to extrapolate reported data to non-reporting listed companies, i.e., companies that typically do not publish their GHG inventory. Since 2013, the firm has sole these emissions information through Camradata, a firm that specializes in institutional investment data and analysis. The methodology leverages direct emissions and electricity data from CDP and covers about 8,000 listed companies. Carbon Screener estimates the carbon footprint of investment portfolios according to "carbon embedded" content by underlying companies. It links up Greenhouse Gas (GHG) emissions – or "carbon data" in tons of CO_2eq to investment in monetary units.[31]

[31], Valery Lucas-Leclin and Sarbjit Nahal, CO_2 - Carbon Screener Primer, Bank of Americal Merrill Lynch, Mar 1, 2013

2.8. Profundo's Approach

Profundo is an economic research organization based in the Netherlands that works primarily for NGOs and ranks banks based on the amount of financing to carbon-intensive sectors. Profundo's exclusive bottom-up methodology calculates inventory listed and private fossil-fuel companies. Additionally, it tracks the transactions between banks and the companies and equity holdings based on Bloomberg and public sources data.

2.9. Carbon Tracker Initiative's Approach

Carbon Tracker Initiative (CTI) is not technically a data provider; however, they use external data to raise awareness about the carbon bubble issue in carbon-intensive sectors. CTI exclusively publishes data and though pieces on the carbon content of fossil fuel reserves allocated to the owners, i.e., the shareholders of energy companies. They concurrently manage a database that tracks the progress towards divestment of coal by large electric utility generators.

2.10. ASN Bank's Carbon Profit & Loss Methodology

(ASN Bank, 2017), The Dutch ASN Bank developed a cross-assets framework to assess its balance sheet and track carbon performance. ASN Bank created a GHG inventory (methodology) for its equity funds, supported by Trucost, and its renewable energy investments, supported by Ecofys. ASN Bank took the next step and commissioned Ecofys[32] in 2013 to develop a Carbon Profit and loss Methodology and Tool to footprint their entire portfolio to balance avoided and financed emissions by 2030 to reach carbon neutrality. The ASN Carbon Profit and Loss Tool results are presented in a profit and loss account, analogous to accounting in the financial sector. Emissions from ASN Bank are shown as losses for the climate, whereas the avoided emissions are seen as profits for the climate.

[32] (2Dii, 2013), Ecofys which built a methodology like the framework developed by Caisse d'Epargne, to calculate emission factors based on a mix of reported data and national statistics

2.11. Partnership for Carbon Accounting Financials (PCAF) Methodology

In November 2020, PCAF released a methodology for financial institutions to measure and disclose their financed emissions to help align with the goals of the Paris Agreement. (PCAF, 2020), PCAF aims to standardize how financial institutions measure and disclose financed emissions and increase the number of financial institutions that commit to measuring and disclosing financed emissions. The PCAF Global Core Team developed the Global GHG Accounting and Reporting Standard, a heterogeneous group of banks and investors of varied sizes and regions. The methodology's asset classes currently include mortgages, commercial real estate, business loans, liquidity equity, and motor vehicles. However, more asset classes will be added according to the interest of its members in future editions of the Standard.

2.12. PACTA/2Dii Methodology

The Paris Agreement Capital Transition Assessment (PACTA) methodology was developed by 2° Investing Initiative (2Dii), an independent, nonprofit think tank working to align financial markets and regulations with the Paris Agreement goals. The objective of the 2Dii methodology is to connect physical assets and financial instruments. By using algorithms, client/entity level data are matched to production databases as a valuable method of analyzing forward-looking data on the expansion of the production capacity of every entity. Another approach adopted in the 2Dii methodology is decoupling portfolios by technology mix to map out decarbonization pathways.

2.13. JPMorgan Chase Paris-Aligned Financing Commitment Methodology

In May 2021, JPMorgan Chase released its methodology for calculating financed emissions, also known as Carbon Compass^{SM}. The methodology was developed by learning from and building on existing approaches, and the firm enlisted the support of ERM to develop their approach to financed emissions. The Carbon Compass methodology incorporates decision-useful metrics and science-based targets on a sector-by-sector basis. The methodology focuses on three main sectors; Oil & Gas, Power, and

Automotive Manufacturing, and adopts the International Energy Agency's World Energy Outlook Sustainable Development Scenarios as of October 2020. Their approach includes computing a portfolio-weighted average of emissions performance for all clients in relevant sectors. Weights are determined based on their cumulative financing to each client as a share of their total financing to the sector. The methodology also includes both financings that directly provided and their share of facilitated financing.

2.14. Case Studies

Amongst all methodologies explored, the 2Dii and PCAF Standard are the most widely accepted and implemented approaches banks use. Below are a few case studies of banks that have disclosed financed emissions using some popular methodologies:

Application of 2Dii PACTA and PCAF Standard at ABN AMRO [33]

To fulfill its commitment to achieving a Paris-proof[34] economy by 2030, ABN AMRO enlisted the help of 2Dii and PCAF to assess the financed emissions of some carbon-intensive portfolios and track progress towards climate alignment. The bank set climate alignment goals for its loan exposure to power generation and upstream clients. PCAF is a core partner for their work on carbon accounting to report GHG emissions at a portfolio level. At the same time, 2Dii supports its efforts on climate alignment to prepare science-based targets.

The bank's approach in the pilot program of assessing financed emissions is summarized in the following chronological steps:

1. **Scoping** - the bank focused on oil and gas and power portfolio, particularly within areas of the value chain deemed to impact carbon emissions the most, upstream for oil and gas and power generation. Also, to avoid double-counting of GHG emissions, scoping is used to exclude parts of

[33] All aspects of the case study were pulled from the corporate report - Jan Raes, Dan Koopman, Guiding a bank's energy portfolio to Paris, 2020

[34] As defined by ABN AMRO, Paris-proof means that climate-critical sectors need to lower the amount of greenhouse gas emissions and ABN AMRO should align its financial exposure to climate-critical sectors in line with the goals of the Paris Agreement.

the value chain. Additionally, the bank avoided issues around double-counting by excluding distribution and electricity off-takers and applied a similar logic in the oil and gas portfolio by excluding trading, midstream, storage, and downstream transport value chains within the oil and gas sector.

Diagram 2. Part of sector value chain in scope of analysis: the green checkmark indicates which part of the value chain is in scope.

Figure 1: Scoping Approach adopted by ABN AMRO

2. **Matching –** an essential activity in 2Dii's PACTA methodology and PCAF Standard is data matching. During this process, the banks match their loan exposure to clients in the portfolio to production asset data. The link between production capacity and the loan exposure also contains forward-looking data on clients' expansion of production capacity. The bank sourced market data from the Economic Intelligence database by Global Data and used algorithms and manual matching to connect every client and the production database. ABN AMRO elected to use a matching criterion that must exceed 80% before starting any alignment analysis with the Paris Agreement. The bank was able to achieve the matching percentages below.

Diagram 2 bis. Matching percentage of the loan book exposure in scope of analysis

Sector value chain	Loan book exposure (in billions of euros)	Match percentage by 2DII tooling
Upstream fossil fuels	5.7	85%
Power generation	2.2	87%

Figure 2: Matching Score Achieved by ABN AMRO

3. **Allocation/Attribution –** To accurately study the financial allocation of their portfolio, production capacity is weighed according to the size of the loan to the client in the portfolio. For example, a loan of 100,000 euros has a more significant impact than a loan of 1 billion euros. The allocation method allows banks to align their financial exposure with the different climate scenarios and the Paris Agreement. ABN AMRO's used the International Energy Agency's Sustainable Development Scenario as a frame of reference because it provides a pathway for the energy sector to transit to net-zero. The firm used 2Dii's allocation method, where all clients provide the same proportion of effort relative to their size. Market intelligence data is used to forecast future installed capacity to connect financial data and IEA scenarios using 2Dii's allocation rule. For ABN AMRO, the forecast period extended until 2024.
4. **Analysis and Benchmarking -** 2Dii calculates the technology mix for each client based on the production capacity data in the 2Dii production database. This assumption is essential because IEA scenarios allow a diversity of installed technologies. Analyzing the technology mix of the client helps to show their degree of alignment to the IEA scenario. It also shows the production capacity distribution across low and high carbon technologies. The data on the technology mix also gives ABN AMRO a first indication of which companies it needs to engage with first. ABN compares the current production capacity and the client's forward-looking plans to the trends in the IEA scenarios.

See an anonymized version of some of the bank's clients below:

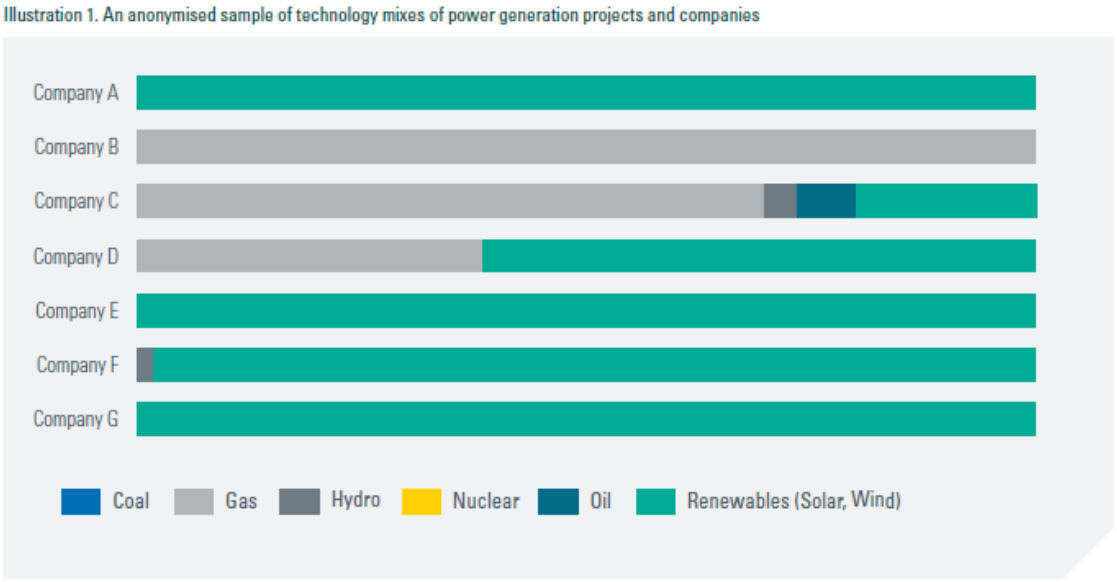

Figure 3: Anonymized View of ABN AMRO's Power Generation Portfolio Mix

5. **Aggregation:** all attributed client-level data are summed up to arrive at the portfolio technology mix per sector to provide holistic portfolio trends. The example below is a snapshot that shows whether the companies currently present in the loan portfolios with further developed renewable capacity. The analysis shows that ABN AMRO allocates more exposure to those companies and projects that have already developed renewable energy generation capacity.

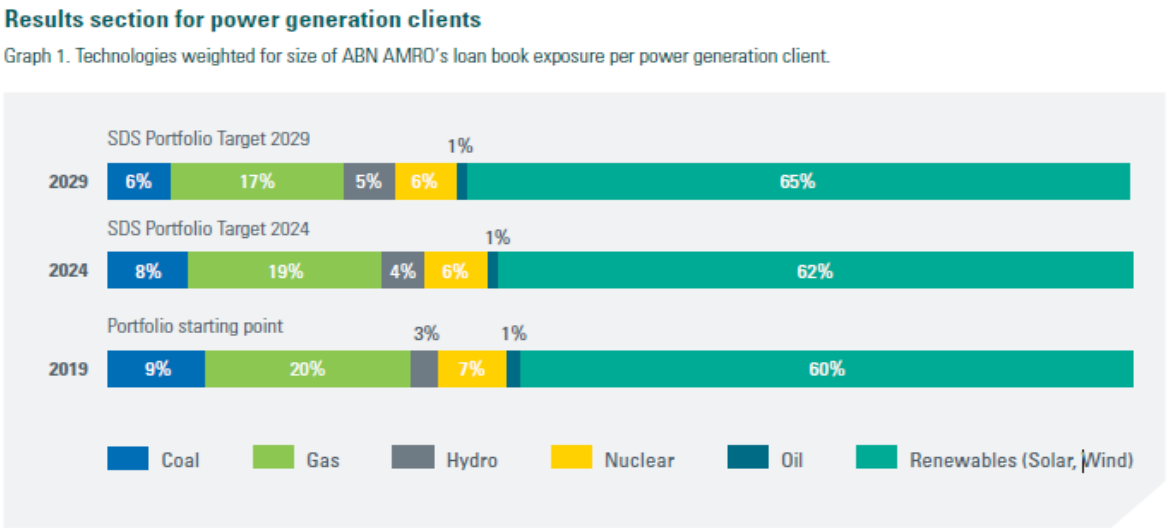

Figure 4: ABN AMRO Power Generation Portfolio Mix

6. **Benchmarking –** ABN AMRO analyzes all client's expansion plans collectively. The bank also assesses the rate of change of technology shifts and benchmarks the portfolio to the shifts prescribed by all IEA climate scenarios.

Graph 2. Rate of change for renewables and coal for power generation clients compared with IEA scenarios.

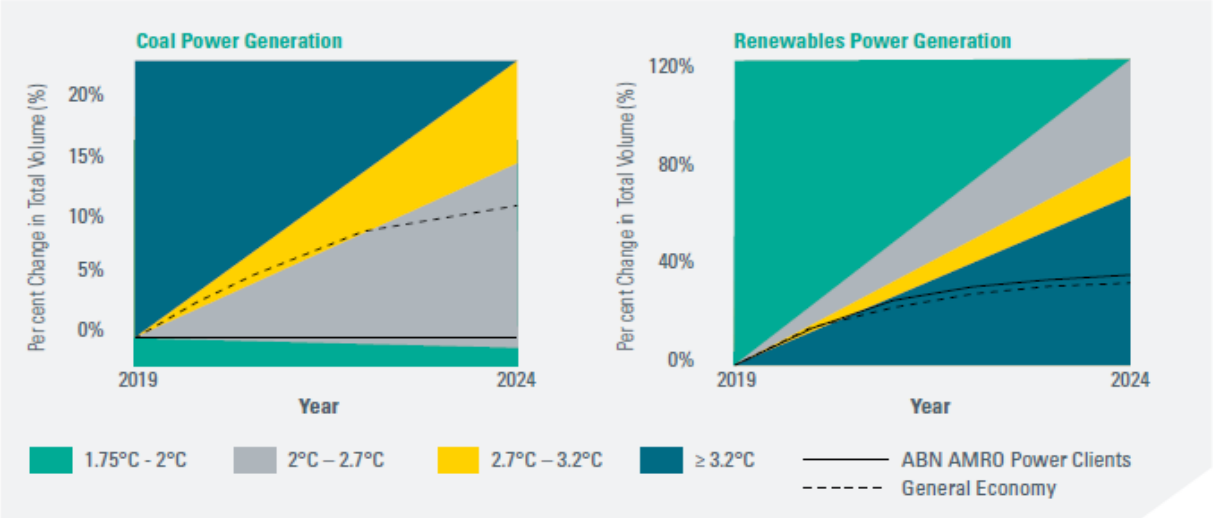

Figure 5: ABN AMRO Power Generation Portfolio Mix Compared to IEA Scenarios

In conclusion, ABN AMRO's adoption of PCAF's carbon accounting and 2Dii PACTA's climate alignment model shows how selecting individual clients and projects in carbon-intensive sectors makes a difference in the degree of alignment with the Paris Agreement. The next step for the bank is to use the results to formulate science-based targets.

Preliminary Disclosure of Financed Emissions at NatWest using PCAF Standard[35]

As the first major UK bank to join Partnership for Carbon Accounting Financials (PCAF) and a signatory to Science Based Targets initiative (SBTi), NatWest bank announced an ambitious goal in February 2020 to halve the climate impact of their financing activity by 2030. Recognizing the critical role of measurement, the bank developed and disclosed preliminary financed emissions estimates for four high climate impact sectors and emissions intensity estimates for 2030 and 2050 for three of those four sectors. The four sectors assessed include residential mortgages, oil and gas, automotive, and agriculture. They were selected based on their proportion of the NatWest Group's total loans and investments as fiscal year-end December 2019, combined with the sector's climate impacts. The bank's core objective in assessing financed emissions was to enable it to:

- Identify, assess, and manage climate-related risks and opportunities,
- Understand the drivers of climate-related transition risks and opportunities in their business,
- Set and navigate emissions reduction goals,
- Act to reduce their climate impact.

The PCAF and 2Dii PACTA methodologies were primarily used to assess financed emissions and mainly applied the PACTA method to assess emissions intensity in the automotive manufacturing sector and focusing on extraction activities in the oil and gas sector. The bank also found SBTI and PCAF helpful in assessing the most appropriate emissions intensity metrics. In designing a climate alignment strategy, the bank used the IEA's Beyond 2°C Scenario (B2DS) from the Energy Technology Perspectives (ETP) report for assessing indicative emissions estimates for automotive manufacturing and the Committee on Climate Change or (CCC) 'Sixth Carbon Budget, the U.K.'s path to net zero' to estimate emissions intensities for 2030 and 2050. The table below provides an overview of the standards, methodologies, and scenarios used as inputs for assessing absolute emissions applied by the NatWest Group:

[35] All sources of information drawn from NatWest Group, 2020 Climate Related Disclosure Report

Sector	Financed Emissions standard	Scenario
Residential mortgages	PCAF (November 2020)	CCC, sixth carbon budget (1.5 degrees, 50% probability)
Agriculture (primary farming)	PCAF (November 2020)	CCC, sixth carbon budget (1.5 degrees, 50% probability)
Automotive manufacturing	PCAF (November 2020)	IEA ETP's B2DS scenario (1.75 degrees, 50% probability)
Oil and gas extraction	PCAF (November 2020)	N/A

Figure 6: NatWest Group Application of Financed Emissions Methodologies

When assessing financed emissions, the bank saw the need to improve climate data capabilities across all sectors. Existing climate-related granular customer information wasn't readily available in all cases. As a result, the preliminary estimates required assumptions, extrapolations, or aggregation at sub-sector levels. The total loans and investments to the four sectors and balances analyzed for absolute emission and emissions intensity estimates in noted in **figure 7**.

	2020	2019			
Sectors	Total loans and investments (£bn)	Total loans and investments (£bn)	Loans and investments used to estimate financed emissions and emission intensity estimates		Reason for difference or exclusion:
			Balance (£bn)	% analysed	
Residential Mortgages	190.5	174	174	100	The entire residential mortgage portfolio has been included for calculation of financed emissions.
Agriculture	5.3	4.9	3.8	78	Customers engaged in primary farming activity have been included as they have relatively uniform emissions profiles that can be matched to external targets like the CCC. Balances excluded primarily relate to forestry and fishing, and other agriculture related ancillary, manufacturing and service activities.
Automotive	6.3	6.2	0.3	5	Aligned to the Katowice Banks guidance which recommends focusing on sectors that are both material contributors to emissions and have significant ability to drive mitigation, we have limited the scope of our analysis to automotive manufacturing activities. The manufacturers of cars are in a better position to change the emissions profile of vehicles than equipment manufacturers, or companies involved in car rentals or sales. See diagram on this page for sub-sectors of the oil and gas value chain we analysed and excluded for the purpose of this work. In addition, emissions and production data from major motor vehicle manufacturers was freely available in annual reports and sustainability disclosures.
Oil and gas	1.6	2.1	0.6	29	Aligned to the Katowice Banks guidance which recommends focusing on sectors that are both material contributors to emissions and have significant ability to drive mitigation, we have limited scope to oil and gas extraction activities. See diagram on this page for sub-sectors of the oil and gas value chain we analysed and excluded for the purpose of this work. In addition, emissions and production data for oil and gas extraction companies are widely available from customers' sustainability disclosures and annual reports.
Total	203.7	187.2	178.7	95.5	
Total NatWest Group [1]	428.4	399		44.8	

(1) Comprises loans and advances to banks and customers, debt securities and equity shares at amortised cost and FVOCI, gross of ECL.

Figure 7: NatWest Group Portfolio Coverage for Financed Emissions Assessment

The bank applied the following treatment to the portfolio's analyzed:

- **Residential Mortgage** – the bank utilized Energy Performance Certificates (EPC) data as an estimate of the underlying climate impact. EPC data was sourced from publicly available customer information for England and Wales for the year of inspection by a qualified EPC surveyor. As of December 2019, EPC data was available for just under half of the residential mortgage portfolio, achieving a PCAF data quality score of 3.
- **Agriculture** – when assessing the agricultural portfolio, the bank used UK-specific sector level revenue emissions intensity metrics from EXIOBASE[36] 2011 and applied these to customer revenues to estimate absolute emissions.

[36] EXIOBASE is a global, detailed multi-regional environmentally extended supply use table and input-output table.

- **Automotive Manufacturing** – Absolute financed emissions for automotive manufacturing were calculated Scope 1, Scope 2, and Scope 3 tailpipe emissions. As the reporting for Scope 3 tailpipe emissions is not uniform across all customers, the bank estimates using average tailpipe emissions factors for car model and fuel combinations from the Worldwide Harmonized Light Vehicle Test Procedure (WLTP), a globally harmonized standard of drive cycle test to determine the tailpipe emissions and fuel efficiency of passenger cars. The bank sourced 97% of publicly available data from customers' externally available disclosures for their automobile portfolio.
- **Oil and gas** – the bank estimated emissions for only the extractive sub-sector, with a high climate impact. The table below shows NatWest Group's estimated financed emissions and physical and economic emissions intensities for the four sectors reviewed laid out in a PCAF supported reporting format:

	Preliminary estimates of financed emissions and emission intensities 2019					
Sector	Financed emissions ($MtCO_2e/y$) [1]		Physical emissions intensity [2]	Economic emissions intensity (tCO_2e/£M invested) [3]	PCAF Data quality score	
	Scope 1 and 2	Scope 3			Scope 1 and 2	Scope 3
Residential mortgages	2.2		39 $kgCO_2e/m^2$	12	4.1	
Agriculture (primary farming)	3.6		2,205 tCO_2e/ £m revenue	940	4.3	
Automotive manufacturing[4]	0.01	0.53	168 gCO_2/km	1,790	2.1	3.1
Oil and gas extraction	0.08	1.9	75 tCO_2e/TJ	3,054	2.4	2.6

Figure 8: NatWest Group Preliminary Financed Emissions for 2019

JPMorgan Chase's Effort Implementing Carbon Compass^{SM} Methodology[37]

JPMorgan adopts a different approach for each sector and assesses three main sectors – oil and gas, electric power, and auto manufacturing. However, the case study below outlines the general framework for assessing only the auto manufacturing portfolio:

- **Boundaries:** The bank evaluates the carbon intensity of global sales of new passenger cars and U.S. sales of light trucks (e.g., SUVs, vans, pickups). The portfolio includes companies that sell passenger vehicles anywhere in the world. Given the significantly greater market and regulatory complexity and limitations on available data, they currently do not evaluate portfolio companies that exclusively sell medium- and heavy-duty commercial vehicles or any companies' sales of commercial vehicles. For passenger vehicles included, the bank evaluates tailpipe emissions from vehicle use and Scopes 1 and 2 emissions during manufacturing. The bank does not currently include emissions from the production and delivery of the Energy used by vehicles. Omitting these emissions within the Auto Manufacturing portfolio allows the bank to avoid double-counting since the methodology already covers the Oil & Gas and Electric Power sectors, which provide fuel for ICEs and E.V.s, respectively. Despite its significant materiality, the bank does not currently include emissions "embedded" in parts and materials manufacturers purchase from third parties (Scope 3 — supply chain). **See figure 9.**

[37] All sources of information drawn from JPMorgan Chase & Co, **Carbon Compass^{SM}** Paris-Aligned Financing Commitment Methodology

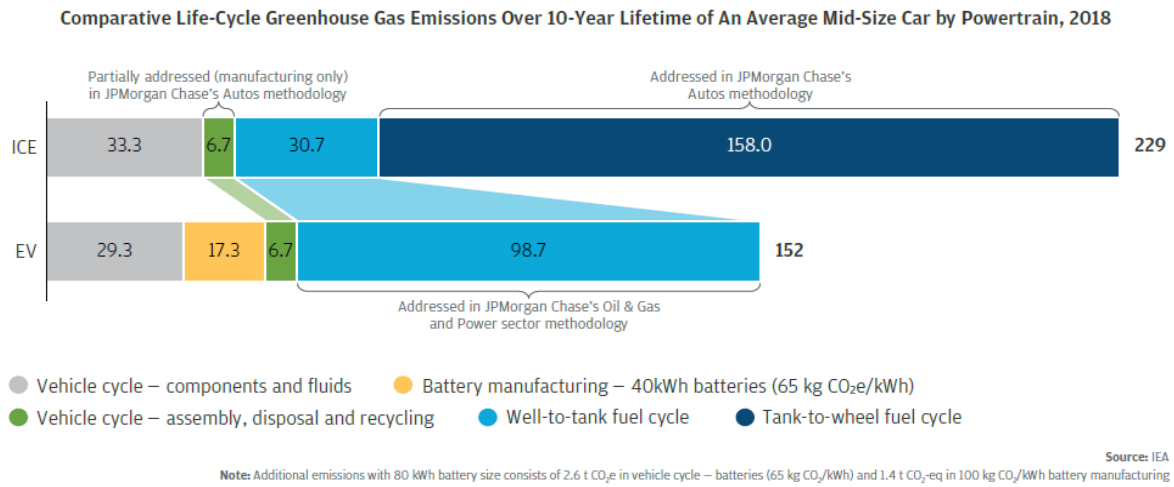

Figure 9: JPMorgan's Auto Manufacturing Sector Boundary for Financed Emissions

- **Metric:** The bank used the intensity-based metric of sales-weighted average grams of carbon dioxide equivalent (CO_2e) emissions per kilometer for new cars sold. Motor vehicles were assumed to have 150,000 km of vehicle life or approximately 11 years of driving, measured on a global average basis. This approach helps evaluate companies' performance continuously and effectively incorporating end-use emissions. See the formula applied below:

$$\frac{\text{Scopes 1 \& 2 Emissions from Manufacturing (g } CO_2e)}{\text{Lifetime Kilometers of New Global Cars and U.S. Light Trucks (km)}} + \text{TTW Emissions of Global Cars and U.S. Light Trucks (g } CO_2/\text{km)}$$

Figure 10: JPMorgan's Auto Manufacturing Sector Equation for Financed Emissions

- **Scenario and Target:** The bank's benchmark trajectory is based on the IEA Energy Technology Perspectives Beyond 2°C Scenario (B2DS) adapted and applied by SBTi's Sector Decarbonization Approach (SDA) Transport tool. The bank could not use the SDS directly since the IEA does not publish detailed SDS modeling results to derive relevant portfolio targets for the Auto Manufacturing sector. In contrast, the SBTi SDA Transport tool's refinement of the B2DS scenario enabled them to derive the necessary targets, particularly those applicable to passenger vehicle sales. The bank set a 2030 target of 92.3 g CO2e/km for their Auto Manufacturing sector portfolio, representing a 41% reduction from their 2019 baseline of 157.8 g CO2e/km.

- **Data Sources and Considerations:** When estimating sales-weighted carbon intensity values for each company in the auto manufacturing portfolio, they used the approach developed by the Transition Pathway Initiative (TPI) for deriving g CO2/km from reported average miles per gallon (MPG) while incorporating U.S. light truck sales and Scope 1 and 2 manufacturing emissions. Additionally, they estimate the carbon intensity for U.S. light trucks using TPI's methodology and the company's average fuel economy for light trucks reported by the National Highway Traffic Safety Administration (NHTSA). Calculations for the Auto Manufacturing sector portfolio will generally be subject to a two to three-year data lag due to a significant lag in reporting of certified model year fuel economy and sales values due to typically long sales cycles (i.e., up to 22 months spanning three calendar years) for individual model years in the U.S.

Implementing P9XCA Methodology at Société Générale[38]

In June 2019, Société Générale released quantified figures for its financed emissions within their Task Force on Climate-Related Financial Disclosures (TCFD) report. Among other methodologies, Société Générale used the P9XCA methodology to assess its financed emissions. P9XCA's top-down approach was applied, which allocates all GHG emissions to sources of finance based on their market share by economic sector and geographies. The bank did not provide a detailed breakdown of the methodology; however, **figure 11** shows the historical emissions reported on the corporate credit portfolio.

[38] Relevant information pulled from Société Générale, Task Force on Climate-related Financial Disclosures Report, June 2019

Table 14: Financed emissions indicators

	Scope	Unit	2015	2016	2017	2018
Transport	Corporate credit portfolio	MTCo2e	31	42	42	**45**
Energy	Corporate credit portfolio	MTCo2e	33	38	36	**37**
Manufacturing industries	Corporate credit portfolio	MTCo2e	16	17	18	**18**
Process industries	Corporate credit portfolio	MTCo2e	10	12	13	**14**
Waste Management	Corporate credit portfolio	MTCo2e	7	7	7	**7**
Agriculture & land use	Corporate credit portfolio	MTCo2e	-13	-13	-14	-17
Total	Corporate credit portfolio	MTCo2e	84	104	101	103

Figure 11: Societe Generale's Application of P9XCA Methodology

In the bank's subsequent TCFD report for the fiscal year ending 2020, it appears that they have discontinued the methodology as they used 2Dii's PACTA's bottom-up approach instead of P9XCA for understanding portfolio emissions trends and craft climate alignment strategies.

2.15. Nascent Methodologies and Developments on Financed Emissions

As observed from case studies, most bottom-up financed emission methodologies cater to a limited number of sectors such as oil and gas and power and utilities, which means other carbon-intensive sectors such as shipping, and agriculture may be overlooked. The work to improve the assessment of other sectors is currently led by several players ranging from environmental thinktanks to academia fostered by open-source and collaborative efforts by big players in the financial sector. In June 2019, the Rocky Mountain Institute unveiled a framework for climate alignment in the shipping sector called the Poseidon Principles. [39]The Poseidon Principles leverages climate targets the International Maritime Organization (IMO) agreed on to establish a robust framework for quantitatively assessing financial institutions' shipping finance portfolios. Signatories commit to fostering the decarbonization of the maritime shipping

[39] Mitchell, J. (2020, July 22). The poseidon principles: A groundbreaking new formula for navigating decarbonization. RMI. Retrieved January 21, 2022

sector, and it is anticipated that PCAF adopts the core principles as it releases updated versions of the Global GHG Accounting and Reporting Standard for the Financial Industry.

Within the financial industry, there is increasing collaboration amongst sector players to improve understanding of financed emissions methodologies and develop tools to aggregate data, model and make results decision-useful. OS-Climate is building technology platforms to improve scenario-based predictive analytics for various geographies, sectors, and asset classes with banking partners. The most recent collaboration within this space is a consortium of 19 banks across U.S. and Canada and the Risk Management Association to develop standards for measuring and managing climate risk. [40]In addition, the consortium hopes to engage financial regulators to drive system change within the industry. Recently, the Office of the Comptroller of the Currency (OCC) released a draft climate risk guidance in line with global principles that will shape expectations for regulated banks with more than $100 billion in total consolidated assets within the U.S.[41] Everyday new developments emerge. It will be interesting to see how they evolve in the coming years.

2.16. Regulatory Landscape on Financed Emissions Disclosure

Financial institutions currently shoulder the burden of disclosing financed emissions due to the absence of adequate legal and regulatory duties to disclose. Financial institutions may use innovative ways to incentivize borrowers to disclose their emissions profile using some examples mentioned in **section 4.2.** However, it is difficult to determine if those levers will bear expected results. Regulations around financed emissions seemingly correlate with current ESG regulatory enforcement agendas within specific geographies.

The European Union (EU) is often regarded as a trend setter in ESG regulations, and that has been the case with the guidelines proposed and ruled under the, for example, financial institutions are required to

[40] Vanderford, R. (2022, January 12). Big Banks band together to measure and manage climate risk. The Wall Street Journal. Retrieved January 21, 2022

[41] Vanderford, R. (2021, December 16). Climate risks for big banks could hurt financial system, OCC says. The Wall Street Journal. Retrieved January 21, 2022

start including scope 3 emissions for the oil, gas, and mining sectors from 2021 onwards, and add other sectors from 2024. [42] In the United States (U.S.), financial regulators have started focusing on climate-related disclosures; the OCC's recent publication on the "Principles for Climate-Related Financial Risk Management for Large Banks" is a testament to that effect; however, there is still a long way to go to release prescriptive statements that mandate the release of material ESG information such as financed emissions. On a global front, conversations to drive the disclosure of financed emissions by local financial players may often be led by the central banks. Efforts from bodies such as the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) must be highlighted. NGFS's purpose is to strengthen the global response required to meet the Paris agreement's goals and enhance the role of the financial system. NGFS has released several publications to guide central banks on preparing climate-related disclosures, and central banks of countries such as Brazil and Singapore have released inaugural sustainability reports. These efforts by central banks send a strong positive signal across financial markets; however, as much these efforts encourage disclosure of specific environmental, social, and governance information to the public, these reports might never contain disclosure of financed emissions due to current limitations around methodologies especially when working with government-related borrowing. Data quality is often a considerable hindrance that discourages financial institutions from reporting financed emissions, and empirical research to quantify the degree of error for different data quality scores needs to be conducted to give comfort and credence to all users of publicly disclosed reports. Lastly, financial regulators such as the U.S. Securities and Exchange Commission (SEC) will need to categorize financed emissions as "material" which might be a proposed rule that will face significant opposition from regulators.

[42] EU Technical Expert Group on Sustainable Finance. (2019). Financing a Sustainable European Economy: Report on Benchmarks: Handbook of Climate Transition Benchmarks, Paris Aligned Benchmark, and Benchmarks' ESG Disclosure. Retrieved from European Commission: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/192020-sustainable-finance-teg-benchmarks-handbook_en_0.pdf

CHAPTER 3 – Overview of the PCAF Standard

GHG accounting follows a unique set of generally accepted principles similar to financial accounting and reporting GAAP to ensure that organizations disclose accurate, verifiable, and fair accounts of their GHG emissions. These principles can be found in the GHG Protocol Corporate Accounting and Reporting Standard [43] and the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.[44] PCAF adopts these core principles of completeness, consistency, relevance, accuracy, transparency, and others highlighted in **Section 3.1**. Additionally, other important considerations around financed emissions as laid out by these guidelines were discussed briefly in **Chapter 1**. The Global GHG Accounting and Reporting Standard for the financial industry herein referred to as "the PCAF Standard" follows these five core principles because the Standard was "built on the GHG Protocol" and provides additional requirements on applying the principles directly relevant to calculating financed emissions.[45] Compared to other methodologies, the PCAF Standard has garnered massive success because it is an industry-led initiative spanning various geographies. The Standard is also built on the GHG protocol and adopts a bottom-up approach favored by practitioners and caters to various asset types with a depth of granularity that makes it easy to replicate in their portfolios. Additionally, the PCAF Standard fits perfectly with other existing climate alignment efforts spanning from scenarios analysis, science-based targets, and ESG disclosures, making it highly practical and adaptable.

3.1. Financed Emissions using PCAF methodologies

The additional requirements for assessing financed emissions using the PCAF Standard is summarized below:

- **Recognition** – Financial institutions must account for financed emissions under scope 3 category 15 (investment) emissions, and any exclusions shall be disclosed and justified.

[43] World Resources Institute, WBCSD, A Corporate Accounting and Reporting Standard, 2004
[44] World Resources Institute, WBCSD, Corporate Value Chain (Scope 3) Accounting and Reporting Standard, 2013
[45] PCAF, The Global GHG Accounting and Reporting Standard for the Financial Industry, 2020

- **Measurement** – Financial institutions must "follow the money" and measure and report their financed emissions for each asset class using the PCAF Standard.
- **Attribution** – a financial institution's share of emissions shall be proportional to the size of its exposure to the borrower's or investee's total value. The common denominator is an addition of debt and equity and ensures 100% attribution of emissions over equity and debt providers and avoids double counting of emissions, especially as financial institutions hold both debt and equity positions within similar companies.
- **Data Quality** – Financial institutions shall use the highest quality data where available for each class and improve the quality of the data over time. Data quality scores range from 1 to 5, with 5 indicating the highest uncertainty and 1 indicating the greatest certainty.
- **Disclosure** – public disclosure of the results of PCAF assessments is crucial for external stakeholders and financial institutions to have a good picture and comparable views of how investments are climate aligned.

3.2. Overview of PCAF Asset Classes

The PCAF Standard currently caters to six asset types – listed equity and corporate bonds, business loans and unlisted equity, project finance, commercial real estate, mortgages, motor vehicle loans. The section aims briefly discuss asset class definitions and emission scopes, amongst other considerations:

- **Listed Equity and Corporate Bond:** This asset class includes all listed corporate bonds and equity traded on a stock exchange or another securities exchange for general corporate purposes traded on the market and the financial institution's balance sheet. The emission scope covers borrowers' and investees' absolute scope 1 and scopes 2 emissions across all sectors. However, some sectors must report scope 3 emissions of borrowers, and investees must be reported as guided by the European Union Technical Expert Group on Sustainable Finance (TEG). *To adhere*

to the guidelines, financial institutions shall start including scope 3 emissions for the oil, gas, and mining sectors from 2021 onwards, and other sectors will be added from 2024.[46]

- **Business Loans and Unlisted Equity:** As drawn from the PCAF standard, *business loans include all loans and lines of credit for general corporate purposes to businesses, nonprofits, and any other structure of an organization that is not traded on the market, while unlisted equity includes all equity investments for general corporate purposes to businesses, nonprofits, and any other organizational structure that is not traded on the market and is on the financial institution's balance sheet*. [47] Emission scope coverage follows similar guidelines as listed equity and corporate bonds, which covers borrowers' and investees' absolute scope 1 and scope 2 emissions across all sectors and adopts the TEG recommended phased-in approach for borrowers and investees with scope 3 emissions.
- **Project Finance:** *This asset class includes all loans or equities to projects for specific purposes (i.e., with known use of proceeds defined by the GHG Protocol) on the financial institution's balance sheet*.[48] The financed activities are included, excluding emissions and financials related to existing activities outside the financed project but within the organization. Absolute emissions for Scope 1 and 2 must be reported, and optionally Scope 3 emissions should be covered if relevant. Firms may choose to disclose avoided and removed emissions; however, they must be reported separately from absolute emissions.
- **Commercial Real Estate:** *This asset class includes on-balance sheet loans for specific corporate purposes, namely purchasing and refinance commercial real estate* [49] *(CRE) and on-balance sheet investments in CRE*.[50] Deals where the asset owner wholly owns the building or partially owns it in a joint venture, joint operation, or joint ownership are also covered. At the same time,

[46] See Footnote 44, p. 49
[47] See Footnote 44, p. 59
[48] See Footnote 44, p. 70
[49] This definition implies that the property is used for commercial purposes, such as retail, hotels, office space, industrial, or large multifamily rentals.
[50] See Footnote 44, p. 78

CRE investments listed in the stock market are classified as listed equity. Emission scopes covered for property already built, financial institutions shall cover the absolute scope 1 and 2 emissions related to the energy use of financed buildings during their operation. Emissions from construction or renovation of buildings are optional, but the financial institution should follow the GHG Protocol's guidance to account for construction emissions.

- **Mortgages:** This asset class includes on-balance sheet loans for specific consumer purposes, namely purchasing and refinancing residential properties, including individual homes and multifamily housing with a small number of units. Properties must be used solely for residential purposes and not to conduct income-generating activities. Absolute scope 1 and 2 emissions related to the property's energy use financed through the Mortgage for emission scope coverage must be considered by financial institutions.
- **Motor Vehicles**: *This asset class refers to on-balance sheet loans and lines of credit for specific (corporate or consumer) purposes to businesses and consumers that are used to finance one or several motor vehicles*. [51] The PCAF Standard does not prescribe a specific list of vehicle types falling within this asset class; instead, it leaves it open for financial institutions to decide and define what vehicle types to include in their inventory of financed emissions. Some examples of vehicles that might fall under the asset class include – passenger cars, motorcycles, light commercial trucks, recreational vehicles, medium/heavy-duty commercial trucks, boats, yellow equipment, etc. In terms of emission scope coverage, financial institutions shall calculate and report the annual scope 1 - Direct emissions from fuel combustion in vehicles and scope 2- Indirect emissions from electricity generation consumed in E.V.s (hybrid and fully E.V.s) of the vehicles being financed. Financial institutions do not need to cover Scope 3 emissions related to the production of vehicles, delivery of vehicles to buyers, or decommissioning of vehicles after use because emissions data are challenging to obtain and are negligible.

[51] See Footnote 44, p. 90

Please refer to the PCAF Standard to find detailed asset-level definitions and scopes.

3.3. PCAF Core Data Requirements

From a data requirement standpoint, financial institutions have three main options:

- **Option 1, "reported emissions,"** involves collecting verified or unverified emissions from the borrower or investee company directly through sustainability reports or indirectly via verified third-party data providers such as CDP and MSCI and then allocated to the reporting financial institutions using the attribution factor.
- **Option 2, "physical activity-based emissions,"** involves estimating emissions based on primary physical activity data collected from the borrower or investee company and then allocated to the reporting financial institution using the attribution factor. Financial institutions may obtain data on verified emission factors expressed per physical activity from credible independent bodies for specific sectors.
- **Option 3, "economic activity-based emissions,"** is majorly guided by statistical data and EEIO databases; this option involves estimating emissions based on economic activity data collected from the borrower or investee company and then allocated to the reporting financial institution using the attribution factor. An example of a metric is tCO_2e/€ of revenue.

Each asset class has unique data requirements; refer to relevant sections in the PCAF Standard for more guidance.

3.4. Attribution of Financed Emissions

Attribution or "Attribution Factor" is perhaps the most critical breakthrough within the PCAF Standard. Attribution is also the most sensitive part of any financed emissions equations. Attribution is the primary way financial institutions allocate their financial contribution to the emissions profile of investees. Each asset class has a distinct method of attribution. Enterprise Value Including Cash (EVIC) is used for listed equities to calculate the attribution factor; the outstanding amount is the numerator, and EVIC is the

denominator. EU TEG defines EVIC *"as the sum of the market capitalization of ordinary shares at fiscal year-end, the market capitalization of preferred shares at fiscal year-end, and the book values of total debt and minorities' interests. No deductions of cash or cash equivalents are made to avoid the possibility of negative enterprise values."* [52] After calculating the attribution factor, the financed emissions of investment in a company are calculated by multiplying the attribution factor by the emissions of the respective borrower or investee company. For example, attribution for the corporate real estate asset class is done using the building's annual emissions based on the ratio between the outstanding amount and the property value at origination. For Motor Vehicles, attribution is achieved by using a portion of the borrower's annual motor vehicle emissions as determined by the ratio between the outstanding amount (numerator) and the value of the motor vehicle at origination (denominator).

There are nuances for assessing each asset class; therefore, refer to the PCAF Standard for detailed guidelines.

3.5. Benchmarking Approaches for Financed Emissions

After assessing financed emissions, benchmarking is crucial in evaluating the analysis results and contrasting the portfolio to industry and leading practices of comparable organizations. However, normalized data is often helpful for banks and investors to manage climate transition risk, set targets, or create new products. Normalizing the data means translating the absolute financed emissions to an emission intensity metric (emissions per a specific unit), and different intensity metrics can be used for different purposes. See the table below for examples of normalized metrics and their advantages:

[52] EU Technical Expert Group on Sustainable Finance, 2019

Metric	Purpose	Description
Absolute emissions	To understand the climate impact of loans and investments and set a baseline for climate action	The total GHG emissions of an asset class or portfolio
Economic emissions intensity	To understand how the emissions intensity of different portfolios (or parts of portfolios) compare to each other per monetary unit	Absolute emissions divided by the loan and investment volume, expressed as tCO_2e/€M invested
Physical emissions intensity	To understand the efficiency of a portfolio (or parts of a portfolio) in terms of total carbon emissions per unit of a common output	Absolute emissions divided by an output value, expressed as tCO_2e/MWh, tCO_2e/ton product produced
Weighted average carbon intensity (WACI)[17]	To understand exposure to carbon-intensive companies	Portfolio's exposure to carbon-intensive companies, expressed as tCO_2e/€M company[18] revenue

Figure 12: PCAF Table for Financed Emissions Metrics

Using normalized data from the assessment, financial institutions can perform four main benchmarking exercises:

- **Sector Benchmarking**: Involves comparing financed emissions for entire portfolios and individual clients to credible industry climate pathways such as the International Energy Agency and Transition Pathway Initiative.
- **Competitive Benchmarking:** Normalized data can be compared to the competing financial institutions' portfolios that have disclosed their financed emissions results using any of the metrics above. However, care should be taken as unique methodologies will not allow an apples-to-apples comparison.
- **Portfolio Benchmarking:** Financial institutions can compare their Yearly performance while tracking their progress on ambitious climate goals and targets for each portfolio.
- **Client vs. Client Benchmarking:** Within a specific portfolio, the bank can compare the normalized emissions data of clients to each other to track which clients are the biggest emitters or in greatest need of change and engagement.

3.6. Limitations with PCAF Standard

The following are common roadblocks financial institutions might face while assessing certain asset classes:

- **Listed Equity and Corporate Bonds:** Assets under management (AuM) change due to fluctuating market prices when using EVIC as the denominator. "*While lower emissions would typically be achieved by encouraging issuers to reduce their absolute emissions (numerator), the recommended calculation methods imply that a similar effect could be achieved by increasing the denominator (either the issuer's equity or debt position).*"[53] Under the influence of this fluctuation, an objective to reduce relative financed emissions by a certain percentage becomes a moving target. Using normalized AuM may help overcome this, as prices are held constant over the target period.
- **Business Loans and Unlisted Equity:** Most of the applicable limitations to listed equity and corporate bond also applies to this asset class; however, in addition, it can be very complex to calculate the attribution factor of loans issued to government-owned or run entities such as municipal waste and water companies or state-owned power utilities. The PCAF Standard aims to release guidelines for this in the next draft.
- **Project Finance:** Emissions removals can be relevant for project finance, especially in renewable or carbon sequestration projects. However, there are no current guidelines from PCAF on how to embed this within financed emissions calculations. It is anticipated that later editions of the PCAF Standard will tackle this issue. Secondly, "*portfolio accounting for emissions occurring in the reporting year does not consider lifetime emissions insofar as these emissions happen before or after the reporting year and is especially problematic for construction projects.*" [54]

[53] See Footnote 44, p. 134
[54] See Footnote 44, p. 75

- **Commercial Real Estate:** Financial institutions will face data challenges when assessing real estate portfolios, especially since many countries lack widespread use of building energy labels. Also, there will be limited access to a borrower's measured energy consumption data, meaning that limited actual data will require financial institutions to estimate building energy use. Property value, another important metric for the CRE assessment, varies in availability globally. Some financial institutions can easily retrieve the property value at origination from their books and do not typically update it annually. At the same time, regulators in other countries require financial institutions to update property values annually.
- **Mortgage:** The limitations assessing financed emissions for Mortgages are similar to those faced for CRE. However, the biggest challenge is on the quality of data due to the privacy of borrowers. Many assumptions must be made to calculate the emissions of mortgages as data is often difficult to retrieve for privacy reasons.
- **Motor Vehicle:** Information regarding actual vehicle distance traveled may not be readily available; therefore, PCAF recommends using local and regional averages on vehicle distance traveled by state, province, or country. The percentage of usage per fuel (e.g., gasoline vs. electricity) for dual fuel vehicles may be unknown, so an average for a hybrid vehicle can be used instead. Lastly, the exact electricity source data will not be known for each vehicle in a financial institution's portfolio, so a local or regional electricity grid mix can be used depending on the borrower's location.

CHAPTER 4 - Implementation Considerations of Financed Emissions

The task of assessing financed emissions of a financial institution's portfolio might appear arduous and extremely complex; however, it does not have to be so. The biggest hurdles any bank may face will entail gathering ESG data on clients in the portfolios and navigating banking systems and applications while maintaining data integrity and adhering to regulatory guidelines. Consequently, upon estimating financed emissions, there is a question on how it should be analyzed to be decision-useful. This chapter provides valuable tips for any financial institution delving into the process of assessing financed emissions and highlights important things to be aware of from an operational and strategic perspective.

4.1. Operational Considerations

Operational considerations for assessing financed emissions relate to all processes within the bank's boundary and control. A sequential list of factors to consider includes portfolio segmentation, portfolio prioritization, scoping approach, data mapping, and reporting considerations.

- **Portfolio Segmentation** – one of the first questions financial institutions must answer is – what portfolios or sectors do we assess first? And what is the best way to segment available data? Financial institutions have typically segmented their portfolios according to industry, geography, or asset type to boost homogeneity and improve risk analytics. This approach is also recommended for portfolio segmentation when assessing financed emissions. Portfolio segmentation on a sector basis is highly recommended because existing methodologies are being rolled out similarly coupled with the ease that is provided for seamless integration with current financial reporting formats within the industry. A sector-based portfolio segmentation also aligns with PCAF principles aimed at promoting apple-to-apples comparison amongst financial institutions.
- **Portfolio Prioritization** – after completing portfolio segmentation activities, the bank must decide which sectors to focus on. A helpful framework to guide prioritization is the acronym P-S-R which stands for Pareto prioritization, Strategic prioritization, and Regulatory prioritization. The Pareto

prioritization approach guided by the 80-20 rule eliminates non-material sectors. Incorporating the 80-20 rule assumes that 80% of portfolio emissions are caused by 20% of select clients within specific sectors. A simple approach to performing a Pareto portfolio prioritization would be by assessing exposure weighted emissions profiles of sectors using a top-down approach. A quick overlay of sector-based GHG inventories and outstanding monetary exposure can highlight carbon-intensive sectors that might be worth pursuing. Strategic prioritization typically uses qualitative factors to decide which sectors to focus on. These sectors may have been highlighted in previous materiality assessment exercises or related to publicly announced goals and targets, investors' pressure, available methodologies, and firm-specific ESG data. Regulatory prioritization entails following the lead on financed emission reporting requirements enacted by financial regulators. This approach would be best suited for countries ahead of the curve in ESG reporting requirements. For example, the E.U. Technical Expert Group (TEG) mandates that financial institutions start including scope 3 emissions for the oil, gas, and mining sectors from 2021. This rule is most appliable to financial institutions operating or having significant exposures in the European markets from a regulatory perspective.

- **Scoping Approach** – When performing scoping exercises, an excellent place to start is using the NAICS or any internal classification systems since they are integrated within banking applications. The main goal of scoping a portfolio is to prevent double counting. Scoping a portfolio requires a thoughtful and well-designed process; however, a rule of thumb would be to "follow the money" while using guidance from the GHG protocol. Practitioners may find that it is not easy to fully apply all principles due to the unavailability of data or navigating data collection processes within existing banking systems. For example, consider a power utility portfolio which comprises of generation, transmission, and distribution; following the logic of "following the financial flow," it is expected that all entities should be within scope; however, on taking a closer look at individual segments, the primary source of emissions is in power generation. Therefore, there is a logical argument to exclude transmission and distribution to avoid double-counting of emissions. Practitioners must ensure that

exclusions made in scoping are not material to the emissions profile of any sector. It is also essential to recognize the depth of emissions profile reporting and the broad challenges of GHG accounting within sectors. Practitioners must make necessary assumptions and proactively engage clients to overcome reporting bottlenecks.

- **Data Mapping** – after determining which assets are in the scope of assessment, financial data and emissions data must be collected for all entities. Practitioners will need to collect financial information on listed and non-listed companies to determine EVIC values. Data can be pulled directly from existing banking applications if available or from third-party data providers. Practitioners will also require data scope 1, 2, and 3 emissions or the production asset data for carbon-intensive sectors such as oil and gas and electric utilities. A last resort might involve pulling information directly from annual reports, but this is not advised unless it is an automated process to guarantee data integrity and continuity. Third-party data providers such as MSCI, Trucost, and Bloomberg provide financial, emissions, and production asset data on most listed entities. Practitioners will need to utilize data scripts to map internal organizational identifiers on clients with identifiers on third-party data sites. Examples of such identifiers include Bloomberg tickers, the Stock International Securities Identification Number, Committee on Uniform Security Identification Procedures numbers, and Exchange Daily Official List.

In summary, the sectorial approach is the best way to assess financed emissions. Financial institutions must engage in a concerted effort to map their client database to emissions data even as early as possible to spot unique data issues within portfolios. Practitioners will need to engage relevant stakeholders such as business units' heads and risk managers for sectors of interest. Often, an excellent place to start is by sharing the value and use-cases of financed emissions data. These use-cases and other strategic considerations are discussed in the next section.

4.2. Strategic Considerations

"You can't manage what you can't measure" is often touted as the biggest reason to begin assessing financed emissions. Recently, investors have a massive push for financial institutions to disclose these numbers; however, what steps financial institutions and their clients take after obtaining this information is more relevant. Financed emissions in an investor's toolkit are powerful, but what financial institutions choose to do with this information beyond fulfilling any reporting requirement is even more powerful. An excellent place to start for any financial institution is using data on financed emissions to engage internal and external stakeholders. Below are non-exhaustive ways in which financed emissions could be applied in strategic decision making amongst stakeholders:

- **Engage Internal Stakeholders** – internal stakeholders in this context refer to the line of business involved in the organization's exposure-making activities. Financed emissions should be factored in when making business decisions. A few use-cases for potential applications include credit rating systems, determining clients' interest rates on loan applications, portfolio risk analysis, sensitivity analysis, internal and external reporting purposes, designing net-zero goals and pathways, etc. For example, a bank can integrate financed emissions into existing credit rating systems and interest calculators to better factor in climate risks when disbursing capital. Financial institutions can also use this information to assess how their portfolios align with the Paris Agreement using open-source climate metric tools from organizations like Transition Pathway Initiative (TPI) or the IEA.
- **Engage Clients** – Financial institutions are uniquely positioned to drive change within industries and must engage their corporate clients. Financed emissions can serve as an excellent data point for separating leaders and laggers within any sector. Financial institutions can utilize their strategic position to understand the drivers of success and failure in these separate groups while encouraging clients at a minimum to create emission reduction targets. Financial institutions can decide what approach is best for their clients; carrot and stick to move clients to act and serve as accountability partners to these organizations. Financial institutions should be attentive to the unique challenges

within industries and contribute through green financing vehicles that promote a low carbon transition and de-risk cutting-edge and scalable technologies.

- **Engage Investors** – investors desire that financial institutions report financed emissions and the actions taken to reduce them. Investors will want to hold financial institutions accountable to any climate goals set using financed emissions. Financial institutions can be creative in reporting financed emissions to investors and employ storytelling to highlight nuisances for different sectors and assumptions made during assessment. Generally, the PCAF standard provided detailed guidance on the reporting requirements for financed emissions; therefore, financial institutions must at a minimum comply with those requirements. Reporting formats may be modified as financial institutions become more sophisticated in calculating financed emissions. For example, financed emissions can be reported geographically and according to the type of technology because investors will desire to see the geographical flow of capital and how it aligns with the Paris Agreement.

The strategic considerations of financed emissions can often be a delicate issue as there are more complexities beyond the abovementioned ideas. As a burgeoning field in ESG reporting, there is still a lot to be uncovered. Still, it can only get better as more financial institutions begin assessment and build out the processes for continuous assessment.

4.3. On the Horizon – Next Big Ideas on Financed Emissions

No one can rightly predict the future; however, it is possible to pre-empt ways financed emissions seep into global climate issues and the role financial institutions will play in those conversations. Some of these topics are highlighted below:

- **Climate Financing** – meeting the Paris Agreement and SDGs will require global financing from billions to trillions. In recent years, an important reference for SDG financing needs has been from UNCTAD's 2014 World Investment Report, where cost estimates pointed to between $3.3 trillion and

$4.5 trillion annually. [55]A deeper look into these estimates shows the significant investment gap in infrastructure spending; power infrastructure ($950 billion), climate change mitigation ($850 billion), and transport infrastructure ($770 billion).[56]A report from IEA highlights selected global milestones for policies, infrastructure, and technology spending to attain a Net Zero Economy by 2050. [57]

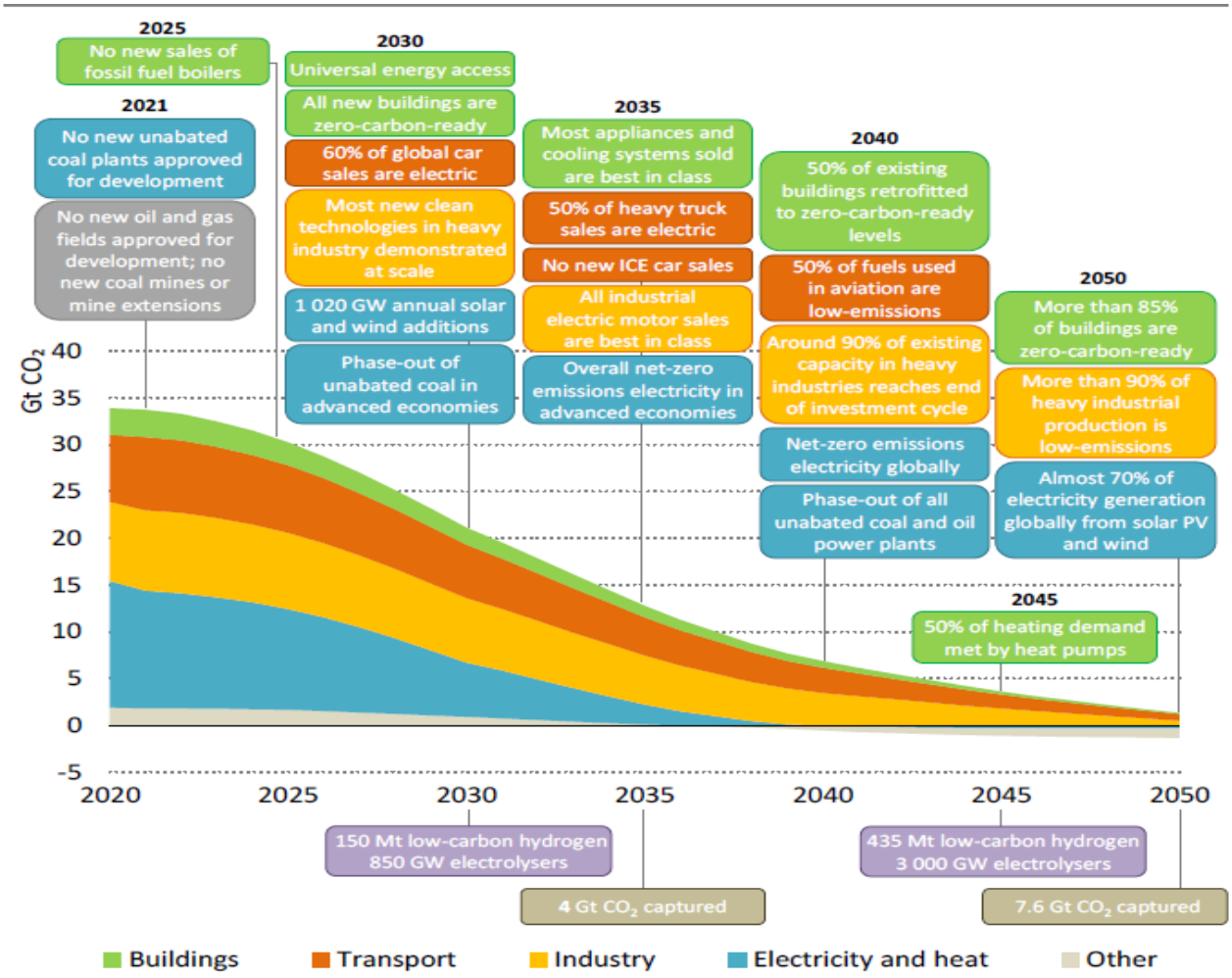

Figure 13: IEA examples of critical infrastructure and technological deployment to attain NZE[58]

[55] Linkages, P. (2014) United Nations Conference on Trade and Development (UNCTAD) World Investment Report (WIR).
[56] Doumbia, D., & Lauridsen, M. L. (2019). Closing the SDG Financing Gap: Trends and Data (No. 143360, pp. 1-8). The World Bank.
[57] International Energy Agency (2021) Net Zero by 2050: a road map for the global energy sector
[58] Ibid

The investment needed to build out the infrastructure to support net-zero emissions is enormous, and the private sector and government have a leading role to play. The private sector highly supports the global adoption of a global carbon accounting standard; however, governments will need to start getting involved in the process because a critical principle in analyzing financed emissions is tracking the environmental impact of capital flows. It isn't easy to ascertain if governments will have the capacity and know-how to track financed emissions of such investments or how the current standards are tailored to government spending. The inability to capture all actions from the most critical players in capital deployment leaves a considerable gap to be filled.

- **Geopolitics** – One of the essential benefits of financed emissions is its power to decision-makers as a tool for environmental and social accountability in the finance sector. This power comes with great responsibility, especially to the stewards who have a fiduciary duty to stakeholders. For example, a universal asset owner such as BlackRock, the firm's CEO, has released newsletters to shareholders in the past few years, which often includes statements on the firm's view on diverse topics touching climate change. BlackRock has used its power to push for TCFD reporting amongst the companies they are invested in. As the reporting systems of financial institutions improve, especially as more global financial players disclose their results, the issue of financed emissions may have some geopolitical implications. The global carbon accounting standard currently supports a sector-guided emissions reporting system; however, as reporting capabilities mature, there might be more exciting ways to dissect data on financed emissions. For example, stakeholders might request financial institutions disclose financed emissions tied to geographic data or investments, especially in developing and developed economies. Also, how will financial institutions relate with state-owned firms when deciding on decarbonization efforts in carbon-intensive sectors? What roles will financed emissions play in halting carbon-intensive infrastructure investments in developed economies to give space for developing countries to grow their economies through traditional energy sources?
- **Just Transition** – financed emissions are more than simply numbers on a page. Life-impacting decisions are on the other side of the coin after emissions numbers are released. For example,

financial institutions may act on such information to determine strategic investments or divestments, a social component tied to the just transition. A just transition is about building and implementing climate actions and goals to leave no one behind, primarily through creating measures to reduce the impact of job losses and industry phaseout during decarbonization efforts. Financial institutions will need to embed social considerations to make decisions using data from financed emissions. For example, ESG policies and ambitions of attaining net zero must be combined with positive social investments that cater to job losses and reskilling of workers in carbon-intensive sectors. Financial institutions will be at the forefront of these conversations and must ensure that no one is left behind.

- **Privacy:** issues on privacy interacting with financed emissions sound futuristic and almost impossible; however, they may be a relevant topic on the minds of financial institutions in a few years. Privacy is primarily tied to consumer spending habits and the corresponding environmental impact. It is difficult for financial institutions with an extensive consumer lending portfolio to ignore the embedded climate risk exposure and the impact on their balance sheet; however, tracking these capital flows and the environmental impact will come with some privacy intrusions, especially from the perspective of customers. Financial institutions will need to find ways to quantify the financed emissions of such portfolios. Additionally, the global carbon accounting standard is mainly dedicated to corporate portfolios; therefore, it will be interesting to see how the Standard grows to cater to personal loans, especially regarding attribution.

These are just a few ideas on the horizon that may impact financial institutions navigating a world where financed emissions reporting is the norm.

CHAPTER 5 - Reflections and Potential Improvements to the Body of Work

It is difficult to predict if efforts on financed emissions will live up to achieve the incredible feats anticipated during its conception, and now a global carbon accounting standard is in the nascent stage of adoption. Only time will tell; however, it is crucial to be cautious and optimistic as global adoption grows. Users of annual reports will need to learn how to interpret the data and ask the right questions to hold financial institutions accountable. In contrast, practitioners should continue refining existing methodologies and developing new ones. At some point, regulatory oversight might be required on financed emissions since the information is powerful enough to alter investment decisions, which will place companies and banks in a position of intense scrutiny.

The most difficult challenges on the horizon of financed emissions will relate to enhancing the existing methodologies of assessment and building credibility around reported figures. The greatest weakness in the Standard is on "*attribution*" and the sensitivity of attribution to market capitalization, which is a critical component of all calculations. For example, in BlackRock's 2021 TCFD report, the company mentions a "*preliminary analysis of the changes in their carbon footprint for major indices saw 45%-60% of the decline between 2019 and 2020 attributable to changes in EVIC."*[59] This implies that yearly changes in carbon intensity metrics might not be attributable to direct actions made by financial institutions but due to market fluctuations. Given the stock market's record year in 2021, it is not far-fetched to assume how this impacted global equity portfolios. Current methodologies need to be able to isolate these sorts of market fluctuations.

There is a need for stronger partnerships between financial institutions and academia to understand how to apply existing methodologies and overcome limitations and gaps in the standards while building a more robust infrastructure for assessments to feed into climate models. This thesis set out to take a deep dive into a qualitative study on financed emissions and achieved that goal; however, there are quantitative areas that are just as important. Therefore, with more collaboration with academia, especially on data

[59] BlackRock (2021). 2021 TCFD report: BlackRock's climate-related disclosures

sharing, the financial sector can move the needle towards climate alignment. Lastly, ongoing collaborative efforts amongst financial institutions must continue; for example, data quality seems to be a problem most banks face; therefore, improving industry transparency or developing open-source databases will enhance reporting standards and credibility. There is still a long way to go, but these steps are needed to push the industry's global adoption of financed emissions assessment.

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