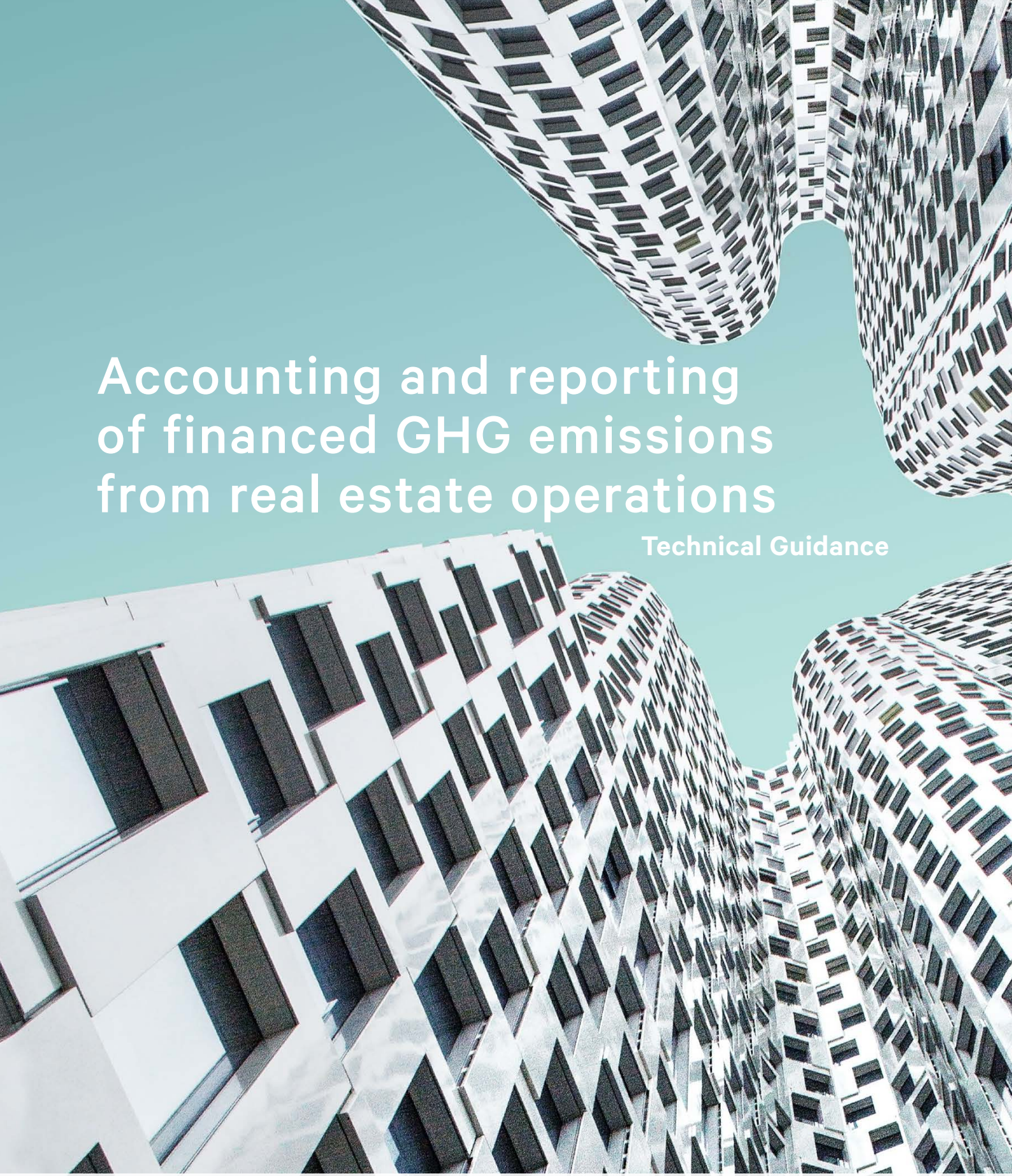

Accounting and reporting of financed GHG emissions from real estate operations

Technical Guidance

DRAFT VERSION FOR PUBLIC CONSULTATION (25 May 2022)

GRESB

PCAF Partnership for Carbon Accounting Financials

CRREM

Partnership

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Partnership for Carbon Accounting Financials

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About GRESB

Mission-driven and investor-led, GRESB is the environmental, social and governance (ESG) benchmark for real assets. It works in collaboration with the industry to provide standardized and validated ESG data to the capital markets. The GRESB 2021 Real Estate benchmark covered more than 1,500 property companies, real estate investment trusts (REITs), funds, and developers. Its coverage for infrastructure includes more than 700 infrastructure funds and assets. Combined, GRESB represents over USD 5.7 trillion in real asset value. More than 130 institutional investors constituting over USD 45 trillion in assets under management use GRESB data to monitor their investments, engage with their managers, and make decisions that lead to a more sustainable real asset industry. The GRESB Foundation – an independent, non-profit foundation – owns and governs the GRESB Standards upon which the GRESB Assessments are based.

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About PCAF

PCAF is a global, industry-led initiative of financial institutions that work together to develop and implement a harmonized approach to assess and disclose the greenhouse gas (GHG) emissions associated with loans and investments, known as financed emissions. Currently, over 200 financial institutions have committed to the initiative. In November 2020, PCAF published the first-ever Global GHG Accounting and Reporting Standard for Financial Industry, which covers the financed emissions of loans and investments in commercial real estate, mortgages, and various other asset classes. PCAF collaborates with several organizations, institutions, and coalitions, including CDP, the Science-Based Targets initiative (SBTi), and the UN-convened Net-Zero Asset Owner Alliance (NZAOA).

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About CRREM

The Carbon Risk Real Estate Monitor (CRREM) initiative has derived decarbonization pathways that translate the ambitions of the Paris Agreement (to limit global warming to 1.5°C by the end of the century) into regionally- and property-type-specific trajectories against which real estate assets and portfolios can benchmark themselves. The pathways and the developed free-ware tool can be used to derive quantitative figures regarding “transition risk” (in this case, the risk of assets being stranded due to regulatory incompliance or market obsolescence). The non-for-profit-initiative is supported by the EU commission, Laudes Foundation as well as APG, PGGM, Norges Bank Investment Management (NBIM).

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Executive Summary

Climate change, as well as the voluntary and regulatory efforts to mitigate greenhouse gas (GHG) emissions in alignment with the ambitions of the Paris Agreement, is already having a significant impact on the financial performance and value of real estate assets. Consequently, organizations that own, finance, occupy, or manage properties face growing financial exposure to these climate-related risks. In parallel, many financial institutions are committing to various goals including reducing their financed emissions to net zero by (at the latest) 2050 and mobilizing capital markets in the global transition to a low-carbon economy.

Credible GHG emissions information enables institutions to assess climate-related transition risks in line with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), set science-based targets, inform their strategies for climate action, and disclose progress to relevant stakeholders.

The GHG Protocol's Corporate Accounting and Reporting Standard (GHG Protocol's Corporate Standard) is the most widely used basis for the accounting and reporting of GHGs. The PCAF Global Carbon Accounting and Reporting Standard for the Financial Industry (PCAF Global Standard) refines and extends the GHG Protocol's accounting rules for Scope 3, category 15 (investments), with an aim to provide detailed guidance per asset class.

The asset class 'real estate' is a segment for which the accounting and reporting of financed emissions differs from that of corporate emissions. Corporate reporting boundaries often differ from building (asset-level) reporting boundaries. For many accounting and reporting purposes, all GHG emissions emitted within the building boundary must be included, regardless of the 'control' of those emissions. GRESB, PCAF and CRREM support this so-called 'whole-building approach' which takes a holistic view of the asset. To decarbonize a specific property and benchmark its operational emissions profile against that of its peers, it is relevant to include all emissions in its GHG accounting.

GHG accounting can be applied for various purposes: annual reporting, regulatory disclosure, and validated target setting or more exploratory endeavors including the estimation of transition risk and strategic asset management. While many of the same GHG accounting principles are used regardless of the intended purpose, some purposes require additional methodological constraints to ensure clear, consistent, and comparable outputs. While some methods are useful for purposes such as the forward-looking management of transition risk, such methods might not be appropriate for the disclosure of real performance for reporting practices.

This document is the first version of jointly developed technical guidance for accounting and reporting GHG emissions from real estate operations. It is intended for financial institutions (banks and investors), and, insofar as they require standardized information, for their underlying real estate assets and companies. The purpose of this document is to provide stakeholders with transparent, consistent, and harmonized guidelines for the accounting and reporting of real estate-related operational emissions. Such guidelines are crucial to the credibility of information

on financed emissions and the subsequent decision-making by investors. To ensure transparency and robustness, this document has been circulated for public consultation prior to final publication.

Main clarifications and key recommendations included in this technical paper are:

- Differentiation between corporate GHG accounting and accounting of financed emissions
- Differentiation between GHG accounting for reporting and for other purposes (e.g., transition risk management)
- Clear definitions for GHG emissions from real estate and differentiation of various categories, including a review of operational carbon vs. embodied carbon in the real estate sector
- Application of the GHG Protocol Corporate Standard for real estate
- The importance of capturing all relevant emissions via the whole-building approach, where whole building = base building + tenant spaces
- Clarification on emissions Scope attribution for various financial actors and boundaries between tenant and landlord emissions
- Recommendations for the application of market- and location-based emission factors; estimation of incomplete data, handling of energy flux measurement, floor space measurement; as well as for quality assurance and verification.

Introduction

The Paris Agreement aims to limit global warming to well below 2°C, with aspirations toward 1.5°C, to mitigate the worst impacts of catastrophic climate change.[1] These high-level, long-term goals need to be supported with policy actions that allocate decarbonization responsibilities across economic sectors, countries, actors, and assets. All market participants need to understand their role in the fight against climate change and align their operations with this goal. However, how to achieve alignment with the goals of the Paris Agreement at the asset level must be clearly defined and presents a major challenge for financial institutions.

Additionally, the large economic, environmental and social rebalancing required by global environmental and economic systems to decarbonize to the degree necessary has introduced the concept 'transition risk', that is, the risks related to the global transition to a low-carbon economy. In the real estate sector, transition risks manifest with the introduction of tighter emission reduction policies, higher carbon and energy costs, shifts in market preferences towards zero-emission properties, and the technological, organizational and behavioral challenges of achieving high energy efficiency. It is consequently of high priority for financial institutions and other organizations to disclose GHG emissions and transition risks of their assets to stakeholders in a clear and transparent manner.

GHG accounting allows for financial institutions to measure, aggregate, and disclose their emissions in order to address these challenges, including alignment with global goals and assessing the linkages between the emissions of their assets and their financial performance.

In practice, however, there remain major challenges to be addressed or overcome related to data collection, measurement, calculation or accounting methodologies for different purposes -- from regulatory disclosure and reporting to exploratory risk management -- and the transparent presentation of GHG emissions within the real estate sector. In particular, the responsibilities for these emissions, and subsequently the reporting requirements, are usually distributed amongst different stakeholders – primarily landlords and tenants – making it difficult to derive clear and consistent implications for investors and financing banks.

This paper predominately focuses on operational emissions. However, embodied carbon is an important source of GHG emissions in real estate accounting, and they can and should be measured or estimated in every project to trigger the best possible solution. Furthermore, this document does not address neither the emissions from building-related municipal waste streams, nor the embodied emissions of building-related water consumption, which could be relevant in e.g. in areas of energy-intensive water, such as California.

This document is the first version of a technical guidance for accounting and reporting of GHG emissions from real estate operations. It is intended for financial institutions (banks and investors), and, insofar as they require standardized information, for their underlying

1 According to the IPCC Special Report: Global Warming of 1.5°C, 2018, global temperature increase must be capped at 1.5°C to avoid the worst climate change effects.

real estate assets and companies. The purpose of this document is to provide financial institutions with transparent, consistent, and harmonized guidelines for the accounting and reporting of real estate-related emissions. Such guidelines are crucial for the credibility of information on financed emissions and the subsequent decision-making by investors. This document also supports financial actors to identify, quantify and report their GHG information with well-defined metrics and targets in order to assess and manage their transition risks according to Task Force on Climate-related Financial Disclosures (TCFD).

The report is divided into three main sections:

1. **GHG accounting.** The first section explores and clarifies basic differences between various accounting requirements and the main frameworks available to support corresponding reporting.
2. **GHG emissions in the real estate sector.** The second section specifies the data collection and GHG accounting requirements related to the accounting of operational GHG emissions of properties.
3. **Guidance and recommendations.** The third section explores the main barriers that financial institutions encounter in the process of estimating and disclosing climate-related risk and accounting on GHG emissions, as well as provides guidance on how these challenges should be handled from a best-practice perspective.

GHG Accounting

What is GHG accounting?

GHG accounting is a necessary step for organizations to manage, align, and control their emissions. Accounting here refers to the processes required to measure the amount of GHGs emitted, avoided, or removed by an entity over a specific period of time. It allows companies or entities to monitor and report these emissions in line with other accounting practices – e.g. financial reporting.

GHG accounting processes and methodologies to collect, summarize, and report GHG emissions allow enterprises to evaluate and set targets, as well as plan GHG reduction strategies and actions more quickly and cost-effectively. The most used standards available for companies to monitor and report GHG emissions (based on emissions associated with final consumption)[2] are those of the Greenhouse Gas Protocol and ISO 14064.[3]

While carbon dioxide (CO_2) is often viewed as the main culprit regarding harmful emissions, it is by no means the only gas that needs to be considered. According to the Kyoto protocol, GHGs include CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).[4] As such, 'carbon accounting' is a frequently used term that refers to the accounting of all GHGs and requires the conversion of these GHGs into 'carbon dioxide equivalents' [CO_2e]. The term is synonymous with 'GHG accounting'. Similarly, terms like 'carbon footprint' or 'carbon intensity' also refer to 'GHG footprint' or 'GHG intensity', respectively.

Importance and applications of GHG accounting

GHG accounting of loans and investments is crucial to increasing transparency and ensuring aggregated GHG figures do not exceed defined thresholds. As such, it is a necessary development to limit dangerous global warming and achieve the goals of the Paris Agreement. Furthermore, due to rising transition risks in the real estate sector, it is of high importance for financial institutions to assess these risks related to their portfolios and constantly report the GHG emissions (and disclose the ongoing reduction). Carbon accounting allows financial institutions to reveal the linkage between financial performance and GHG emissions of their real estate assets to their stakeholders.

A distinction must be made between GHG accounting for regulatory disclosure and reporting purposes, and for metric production for other purposes such as risk management, target setting, or benchmarking.

2 Production-based methodologies, in which emissions are calculated premised on energy generation and other sector processes, are generally used for national accounting purposes. The reporting methodology for national accounting was established by the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, which were revised in 2013. As signatory to the Kyoto Protocol and Annex I party of the United Nations Framework Convention on Climate Change (UNFCCC), the participating countries are required to report their GHG emissions to the United Nations annually.

3 The standard ISO 14064 'specifies principles and requirements at the organization level for quantification and reporting of GHG emissions and removals. It includes requirements for the design, development, management, reporting and verification of an organization's GHG inventory.' (ISO, 2018).

4 UNFCCC, 2012; ICMS, 2021, p. 26

Reporting is meant to give a standardized and consistent view of real performance, or what happened in a given time period. It provides the best understanding of either past or present data. Reporting and disclosure on GHG emissions is an essential aspect of the wider area of non-financial reporting, including Environmental, Social, and Governance (ESG) information, which is of increasing interest to stakeholders spanning the investment community to the broader public. GHG accounting is also central to climate-related disclosures, generally following the recommendations of the TCFD (see Appendix I). This kind of disclosure is becoming increasingly compulsory.[5] CRREM can be used to support TCFD aligned risk assessment and disclosure.

GHG accounting principles and methods also serve as the basis for other uses such as benchmarking, target setting, risk management, etc. However, these other purposes may take advantage of additional methods that modify the actual GHG performance and thus might be inappropriate for reporting, in which standardization and the reflection of real performance is paramount. Such methods might use different boundaries, incorporate assumptions about the future to predict and project, normalize various aspects of the data, or include artificial intelligence- or machine learning-based processing of data. Should such methods be used in reporting, basic guidelines regarding transparency and separate reporting must be followed to ensure that they do not obscure or inflate the credibility of the underlying data. Some of these technical methods, their recommended use and requirements for reporting are presented in the Guidance and Recommendations section of this document.

Similarities of GHG accounting for reporting purposes and metric production for other purposes are:

- Often based on the same intensity metrics.
- Should cover all seven GHGs, not just carbon dioxide.
- Should follow the GHG Protocol Corporate Standard[6] where possible.

Potential differences between GHG accounting for reporting purposes and metric production for other purposes are:

- GHG accounting for reporting purposes considers past or present data, whereas risk management takes past or present GHG data as a starting point and incorporates forward-looking data to create projections.
- Risk management has greater flexibility regarding assumptions and methodological alterations.

5 This technical guidance helps financial institutions to align with upcoming mandatory reporting requirements, e.g. from the International Sustainability Standards Board (ISSB), European Banking Authority (EBA), US Securities and Exchange Commission (SEC).

6 Detailed in following section.

GHG accounting alone cannot provide a full picture of how a real estate asset is likely to perform in a net-zero world. Other factors that finance providers need to consider include an understanding of the sophistication of energy markets where the assets are located, the granularity of metered data, and the tenant's ability to purchase electricity from their retailer of choice. Effective energy benchmarking programs with mandatory disclosure provide market recognition of performance. Finally, data collection is essential, but limited information is often the main challenge in calculating (financed) emissions. However, such limitations should not hinder financial institutions and other corporates from starting their GHG accounting journeys.

Corporate GHG accounting

The Greenhouse Gas Protocol's A Corporate Accounting and Reporting Standard[7] (Corporate Standard) provides an accounting and reporting framework including standards, guidelines, and tools. The Corporate Standard was first published in 2001, with a revised edition released in 2004, and establishes a framework to measure and report GHG emissions from private and public sector operations, value chains, and mitigation actions.

The GHG Protocol defines three different classes (so-called 'Scopes') of carbon emissions (see Appendix II). Generally, the Scopes approximate the level of control an organization has with respect to the emissions (direct or indirect) of each Scope and their capacity to reduce them. Besides its application for reporting, this approach is also very useful in developing carbon reduction plans and is widely adopted by most enterprises. The alignment of data collection, management methodologies and calculation methods ensure interoperability with other reporting initiatives that have adopted the Corporate Standard.

A transparent allocation of emissions to the Scopes of individual stakeholders is crucial for all institutions that report carbon emissions independently. Companies must account for and report emissions from each Scope separately. Generally, each stakeholder involved in the construction, operation, finance and maintenance of a building has their own possibilities to influence carbon emissions (see section Whole-building approach & Scope attribution for more details).

The GHG Protocol Scope 2 Guidance[8] (Scope 2 Guidance) from 2015 is an amendment to the Corporate Standard. It provides clarifications, updated requirements and best practices on Scope 2 accounting and reporting, especially on the location-based and market-based method (see section Location-based vs. market-based method for further guidance).

The Corporate Value Chain (Scope 3) Accounting and Reporting Standard[9] (Scope 3 Standard) is another supplement to the Corporate Standard published in 2011 to provide accounting and reporting requirements for Scope 3 emissions. The Scope 3 Standard categorizes Scope 3 emissions into 15 categories. The Technical Guidance for Calculating Scope 3 Emissions[10] is yet another supplement published in 2013.

7 GHG Protocol, 2004.
8 GHG Protocol, 2015.
9 GHG Protocol, 2011.
10 GHG Protocol, 2013.

Financed emissions accounting

The accounting of GHG emitted by the assets owned or financed in an investment portfolio is the annual accounting and disclosure of Scope 3 category 15 emissions at a fixed point in time, which is in line with financial accounting periods.[11] Accounting for these emissions enables financial institutions, to methodically measure, aggregate, and disclose these "financed emissions". These disclosures are crucial to understand the climate impact of loans and investments – i.e., the contribution to global GHG emissions. Furthermore, financial institutions are increasingly measuring financed emissions for their science-based target setting, climate-related transition risk management and to steer their journeys towards net-zero financed emissions.

According to the Scope 3 Standard, the building-related emissions of equity investments and debt investments for which the use of the proceeds are known, can be either Scope 1, 2, or 3 depending on the delineation of organizational boundaries and choice of consolidation approach. For a review of consolidation approaches, please refer to Appendix III. However, for debt investments for which the use of the proceeds are not known, managed investments and client services, and other investments and financial services, the emissions of the investments may be categorized as Scope 3 emissions (category 15).[12]

The emissions resulting from a commercial bank's loan-book as well as its equity or bond investments in a real estate company fall under downstream emissions. More precisely, these emissions fall under Scope 3 category 15 (investments) of the Corporate Standard. Furthermore, according to the Scope 3 Standard, GHG emissions from loans and investments should be allocated to the reporting financial institutions based on the proportional share of lending or investment in the borrower or investee. The Global GHG Accounting and Reporting Standard for the Financial Industry (PCAF Standard) builds on the GHG Protocol's accounting rules for Scope 3, category 15 (investments), and provides detailed guidance per asset class.

At the asset (building) level, the Corporate Standard dictates that specific emissions may be categorized and reported as either Scope 1, 2, or 3 depending on the delineation of organizational boundaries, choice of consolidation approach (see Appendix III), and the type of lease agreements in place. This works well for corporate reporting because each business can report in a manner that most appropriately reflects its particular situation and reporting purpose. However, when aggregating GHG information to the portfolio level, the choice of organizational boundaries and consolidation approach can no longer be determined by the individual assets and companies. Instead, a single method must be imposed upon each asset so that the emission Scopes retain their physcial meanings upon aggregation. Therefore, while the accounting of financed emissions will leverage the same framework and vocabulary of the GHG Protocol, additional constraints must be placed upon the consolidation approach used to ensure that the resulting portfolio-level information serves the purposes required by financial institutions. (See guidance on Scope Allocation for more information).

11 PCAF (2020) The Global GHG Accounting and Reporting Standard for the Financial Industry. First edition.

12 GHG Protocol, 2011.

Summary points of section GHG Accounting:

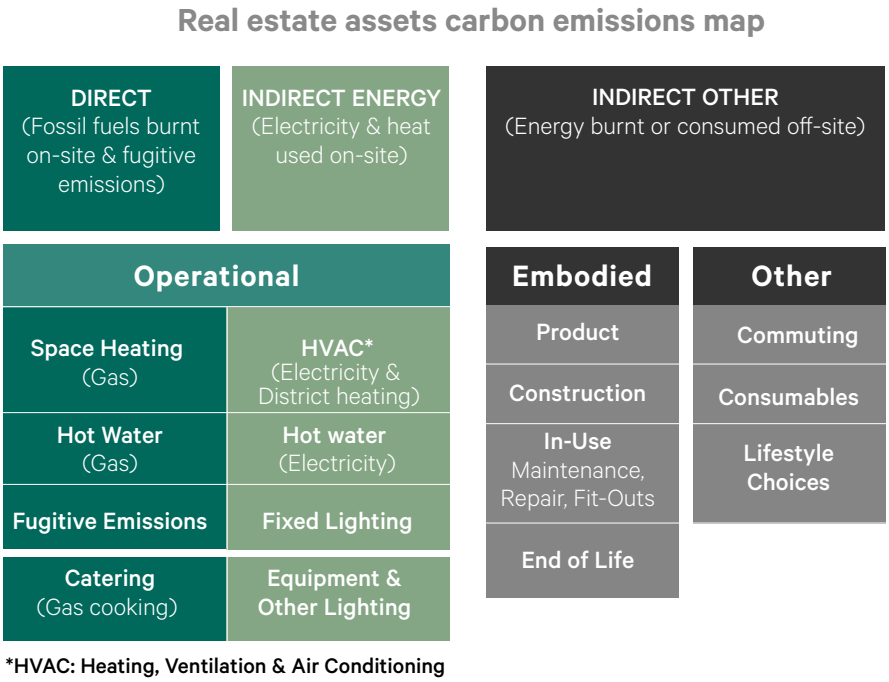
- GHG accounting enables financial institutions to manage, align, control and report emissions in a transparent, robust, and standardized manner. Standardized processes and methodologies facilitate the setting of climate-related targets, align with broader ESG and climate-related initiatives (e.g. TCFD) and monitor progress against such efforts more quickly and cost-effectively. Moreover, financial institutions are able to participate in benchmarking initiatives, reveal linkages between financial performance and GHG emissions, and assess and mitigate transition risks. Even though there are many similarities, it makes a difference if accounting is applied for reporting, which is meant to give a standardized and consistent view of real performance, or other purposes such as target setting and risk management with more flexibility regarding assumptions and methodological alterations.
- GHG Protocol's Corporate Standard is the most widely used basis for GHG accounting, establishing a framework to measure and report GHG emissions from private and public sector operations, value chains, and mitigation actions. The PCAF Standard builds on the Corporate Standard and provides a standardized approach to account for financed emissions with detailed guidance per asset class.
- It is particularly crucial for financial institutions to assess, track, and disclose the emissions of their building portfolios or loan books and continuously monitor performance related to emissions reduction. The emissions from investments (so-called "financed emissions") are part of the financial institution's Scope 3 emissions (category 15).

GHG Emissions in the Real Estate Sector

Categorization of GHG emissions from buildings

GHG emissions from buildings arise from the energy consumption leading to direct and indirect CO_2 emissions and they are resulting from leakages of fluids in cooling and heating systems that could lead to fluorinated gases (F-gases). The energy consumption of buildings and the associated GHG emissions consists of various categories. Figure 2-1 shows an overview of these.[13] Two particularly relevant differentiations of emissions occur between direct and indirect emissions, and between operational and embodied carbon.

FIGURE 2-1: GHG EMISSIONS IN BUILDINGS



SOURCE: CRREM

Direct and Indirect Emissions

In the context of real estate, direct emissions occur within the site boundaries (through fuel burning and refrigerant leakages), whereas indirect emissions are released off-site (including the generation of electricity consumed in the building or the use of district heating and/or cooling).

The Corporate Standard classifies emissions into three 'Scopes'.[14] This classification is closely related to the concept of direct and indirect emissions, highlighted in Figure 2-3. Importantly, Scope 1, 2, and 3 emissions are described below using generalized patterns of ownership most

13 The figure does not intend to provide an exhaustive list of all possible emission sources, but an illustrative example of the most common situation (There are not included here, like emissions from waste and water consumption). E.g. in the EU there is the further differentiation between regulated (covered by the EPCs) and unregulated emissions (see Appendix V for an overview).

14 GHG Protocol, 2004, p.25

often seen in corporate reporting. The 'Scope' of a particular emission is determined by the role of the reporter and purpose of reporting. For financial institutions reporting financed emissions from real estate operations, please refer to the Scope Attribution section of the Guidance and Recommendations below.

Scope 1 – Direct emissions: fossil fuels and refrigerant losses

Scope 1 includes all direct GHG emissions from sources the organization owns or controls. Regarding buildings, the primary source of Scope 1 emissions is the burning of fossil fuels and, to a lesser extent, biomass to produce heat – e.g. for power generation, space heating, production of domestic hot water, and cooking. Fuels used in the built environment can be gaseous (e.g., natural gas), liquid (e.g., heating oil), or solid (e.g., coal and biomass).

Another significant source of direct GHG emissions in the building sector is the fugitive emissions released through the leakage of fluorinated gases (F-gases) (including HFCs and PFCs) during the use, regular refilling, and disposal of refrigeration and air conditioning equipment.[15] Fluorinated gases are emitted "primarily from cooling/refrigeration and insulation with foams". Emissions associated with cooling or refrigeration are regarded as direct emissions, whereas emissions produced during manufacturing insulation materials rank among indirect emissions (embodied carbon). Since these gases are not directly related to heating and energy consumption, they are often overlooked and not tracked at all.

In Europe they amount to approximately 18 % of all GHG combusted/emitted on site.[16] Global emissions from F-Gases amount to 1.7 Gt CO_2e annually.[17] According to the IPCC, buildings account for 'an eighth to a third of F-gases'.[18] Other sources convey percentages up to more than 50%.[19] For some commercial real estate assets, retail properties in particular, these emissions can account for up to 20 to 30% of the overall CO_2e intensity.[20] In very low-energy buildings this share can be even higher. The Phase-Down Pathway for F-Gas emissions was already agreed by the Montreal Protocol's Kigali Amendment in 2016. All countries are divided into two sections: Article 5 and Non-Article 5 countries. Article 5 countries are commited to a less ambitious phase down. The non-article 5 countries are commited to undergo a much faster phase down. Legislators are allowed to deploy a faster track.

Scope 2 – Indirect emissions: electricity and district heating/cooling

Scope 2 emissions include indirect "emissions from the generation of purchased or acquired electricity, steam, heat, or cooling".[21] In buildings, the typical source of Scope 2 emissions is electricity consumption, but the emissions from purchased heat or cooling are also included — e.g. heat or cooling purchased from district heating or cooling networks.

15 GRI, 2016
16 European Environment Agency: National greenhouse gas inventories (IPCC Common Reporting Format sector classification), 2021.
17 J.G.J. Olivier and J.A.H.W. Peters: Trends in global CO_2 and total Greenhouse Gas Emissions 2020 report, 2020.
18 IPCC, 2014. / De Graaf et. al, 2021
19 UNEP: HFCs: A Critical Link in Protecting Climate and the Ozone Layer, 2011.
20 Source: CRREM analysis for a European retail owner with more than 500 stores.
21 Greenhouse Gas Protocol, 2015.

The GHG Protocol defines two calculation methods for the measurement of Scope 2 emissions:

(1) The **location-based method** quantifies Scope 2 GHG emissions based on average emissions intensity of the electricity grids within which the energy consumption occurs. Emission factors (EFs) are often defined using national boundaries, but can also be based on subnational, or even local, boundaries.
(2) The **market-based method** quantifies Scope 2 GHG emissions based on emissions associated with the generators from which the entity purchases electricity. As such, the market-based method reflects the choices an entity makes on its electricity supply, providing a mechanism to account for renewable electricity purchases that reduce emissions.

See the Location-based and Market-based Methods section in the Guidance and Recommendations below.

Scope 3 – Other indirect emissions, embodied carbon

A Scope 3 emission can be defined as an 'other indirect greenhouse gas emission, other than purchased energy-related GHG emissions, which is a consequence of an organization's activities, but arises from GHG sources that are owned or controlled by other organizations.[22] The boundary of Scope 3 GHG emissions can be defined very broadly depending on the reporting objective, including upstream and downstream emissions from various parts of a value chain. In accounting for financed GHG emissions from real estate operations, only building-related emissions, that is the emissions from on-site fuel combustion, electricity use, and district heating and cooling, are to be included in the Scope 3 classification. For example, the business travel (category 6) or use of products sold by tenants (category 10) are not included.

Operational vs. Embodied Carbon

A built asset's overall carbon footprint consists of operational and embodied carbon emissions, and these emissions occur throughout the whole life cycle[23] of a building.

Standards that define the different sources of carbon emissions in buildings are CEN/TC 350[24] and the application of EN 15978[25]. EN 15978 identifies four stages in the life of a building: product manufacture, construction, in-use and end-of-life (see Figure 2-4).[26] It also details subcategories to pinpoint specific sources of emissions. 'Product manufacture' includes the extraction of raw materials (A1), transport to a point of manufacture (A2) and the process of transforming them into

22 ISO 14064-1, 2018.
23 A life cycle assessment (LCA) seeks to 'quantify and address the environmental aspects and potential environmental impacts throughout a product's life cycle from raw material extraction through to end-of-life waste treatment'. (GHG Protocol, 2011b, p. 21) The product life cycle is defined by different standards, including ISO 14040:2006 (ISO, 2006a) and ISO 14044:2006 (ISO, 2006b). The GHG Product Life Cycle Accounting and Reporting Standard (GHG Protocol, 2011b) seeks to consistently report and quantify LCA analyses.
24 European Committee for Standardization CEN/TC 350 – Sustainability of construction works, XX.
25 BSI, 2011.
26 EN15978 also identifies a stage D, which outlines benefits and loads beyond the building lifecycle including reuse, recovery, recycling, and exported energy. These modules will be of great importance for advancements in the built environment with regard to circularity.

construction products (A3). 'Construction' involves the transportation of construction products to site (A4) and the on-site construction processes involved in assembling them into a building (A5). 'In-use' covers the use (B1) - emissions resulting from the use of building elements/materials e.g. concrete carbonation, maintenance (B2), repair (B3), replacement (B4), and refurbishment cycles (B5) of the building components as well as the consumption of energy (B6) and other resource use (B7) during its occupation. In the final stage, 'End-of-Life', the building is deconstructed or demolished (C1), and its redundant components transported (C2) off-site, processed (C3), and disposed (C4).

FIGURE 2-2: EN 15978 BUILDING LIFE-CYCLE STAGES

Product Manufacture	A1	Raw Material Supply		
	A2	Transport		
	A3	Manufacturing		
Construction	A4	Transport		
	A5	Construction Installation Process		
In-Use	B1	Use	B6	B7
	B2	Maintenance (including transport)	Operational Energy Use	Operational Water Use
	B3	Repair (including transport)		
	B4	Replacement (including transport)		
	B5	Refurbishment (including transport)		
End Of Life	C1	De-construction/ Demolition		
	C2	Transport		
	C3	Waste Processing		
	C4	Disposal		

SOURCE: EN 15978, BSI, 2011.

Embodied carbon emissions can be defined as the total GHG emissions generated to produce, maintain and dispose of a built asset. This includes what is known as "upfront embodied carbon"[27] — related to the extraction, manufacturing, transportation and assembly of every building material used to build an asset (identified in modules A1 to A5 in figure 2-2 above) — and "downstream embodied carbon"[28] — related to materials and processes to maintain the building during the use stage, and end of life treatment of the building elements/materials after its use (identified in modules B1 to B5, and C1 to C4 in figure 2-2 above). Downstream embodied carbon emissions excludes module B6 and B7, which are categorized as operational carbon emissions.

The upstream embodied carbon (A1-A5) of existing buildings can be regarded like "sunk costs" in economics. That is, carbon that is already locked in the building envelope and carbon that has been released in all upstream activities that led to building construction have already been

27 WGBC, 2020.
28 WGBC, 2020.

released and are out of range of incentivized reduction. Therefore, the focus of GHG emission reduction in operation is the in-use-phase. According to EN 15978, operational carbon emissions are those caused by the energy consumed by building-integrated technical systems during the operation of the building. Operational carbon emissions include heating, cooling, ventilation, lighting, cooking, IT and equipment, and, for some frameworks, fugitive emissions. Following EN 15978 classification, these emissions fall within stage B6.

Historically, the operational stage has usually constituted the largest source of emissions during the lifetime of the building. However, this is quickly changing in many countries and in general the proportion between embodied and operational carbon in the life cycle of building components is often underestimated. Even without considering any future grid decarbonization, embodied carbon from newly constructed buildings from today until 2050 may equal their cumulative operational GHG emissions in the same period.[29]

The guidance and recommendations in this document are focused on operational emissions (B6). However, embodied carbon and emissions over the entire lifecycle of buildings are extremely important, and data and reporting on whole lifecycle emissions of buildings will likely be required in the near future.

Calculation of operational GHG emissions from buildings

Organizations often focus their data gathering efforts on energy consumption [kWh] and related intensity metrics (e.g. [kWh/m²/y]). These metrics help organizations differentiate energy consumed from different sources, and enable benchmarking, like-for-like comparison and optimization over time.

The most common method to calculate the operational carbon emissions of buildings is by converting the amount of energy consumed in the asset (kWh) and other GHGs emitted on site (e.g. fluorinated gases) into carbon equivalent emissions ($kgCO_2e$). This conversion is done by means of EFs (emission factors), also called conversion factors, carbon factors, fuel intensity factors. These are energy/fuel source-specific coefficients, generally expressed in $kgCO_2e/kWh$ or $kgCO_2e/m^3$ of gas, that are normally calculated or validated by national or supra-national administrations for consistent GHG calculation and reporting within their geographical boundaries.[30]

Static EF: The EFs of some energy sources, often various types of fuels, can be considered static, both geographically and temporally. Despite the differences in the upstream emissions associated with the extraction and transportation of the fuels, the variation in the overall carbon intensity of a particular fuel type[31] from different locations is negligible as the emissions that are released

29 Bionova Ltd., 2018. / according to IEA (2021), Tracking Buildings 2021, IEA, Paris https://www.iea.org/reports/tracking-buildings-2021: additional floorspace will grow from 244 bn m² in 2020 to approx. 4,27 bn m² in 2050. The growth of approx. 1,83 bn m² multiplied by just e.g. 500 $kg/CO_2e/m^2$ would already closely match the remaining operational budget in that period.

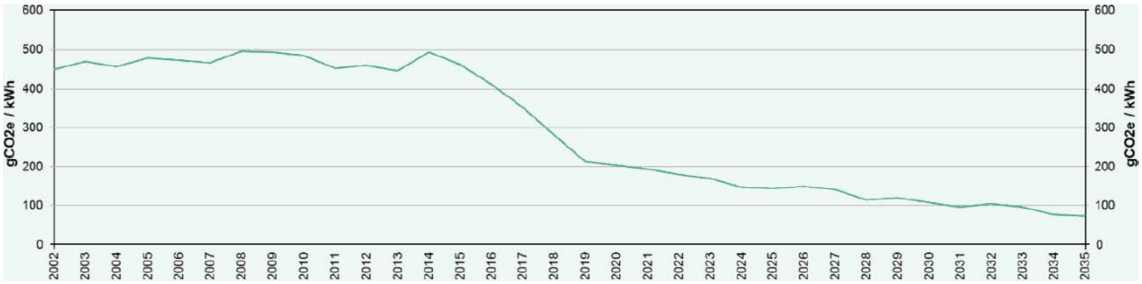
30 The calculation of carbon emission factors for end-use energy sources includes the upstream carbon emissions released by fuel management, including 'well-to-tank' (extraction), transportation, and conversion processes. These upstream emissions vary depending on the energy source and location of extraction point. While for electricity upstream emissions account for 100% of emissions, for fuels which are burnt onsite, they often represent a minimal proportion of the final carbon factor.

31 See GHG Protocol GHG Emissions Calculation Tool, 2020.

during the burning process constitute the grand majority of its supply chain emissions.

Variable EF: The EFs of electricity, district heating, district cooling, and biomass vary geographically and temporally. The EF of electricity varies depending on the mix of energy sources used to generate it and on the local infrastructure, which are largely dependent on each country's energy policy and strategies.[32] These EFs can also be projected over time considering the introduction of policies to change the fuel mix or expected grid decarbonization in the future.[33] Figure 2-3 illustrates a projected EF trajectory for the UK electricity grid.

FIGURE 2-3: PAST AND FUTURE PROJECTIONS (2002-2035) OF UK ELECTRICITY GRID FACTOR (GCO_2E/KWH)



SOURCE: CRREM WITH DATA FROM BEIS

The resulting decrease in the average EF of the electricity generation over time implies that GHG emissions will decrease in the future due to the efforts of the energy sector to decarbonize. Regarding the real estate industry, the decarbonization of electricity generation will 'automatically' result in a reduction of the GHG footprint of buildings, i.e. the same amount of consumed electricity will result in lower electricity-associated emissions. Nevertheless, grid decarbonization will not impact the energy intensity of buildings, which is an important consideration in the assessment of transition risk.

Additionally, residual EFs, used in market-based reporting, resemble the location-based EFs described above, but they reflect the remaining energy mix after the energy – with claimed and retired renewable and low-carbon attributes – has been removed.

Emissions intensities can be used to contextualize emissions in a particular sector, providing a relative performance measure that is decoupled from absolute emissions. GHG intensity values are constructed by dividing absolute GHG emissions by a financial indicator (e.g., revenue, market capitalization) or sector-dependent unit of output. In the case of real estate, the United Nations Environment Programme (UNEP), GHG Protocol, TCFD, and others recommend calculating the GHG intensity as GHG emissions per square meter, using the unit [$kgCO_2e/m^2$/year] (kilograms

32 According to data from European Environment Agency the emission factors of electricity in France (0.0348 $kgCO_2$/kWh) and Sweden (0.0105 $kgCO_2$/kWh) are low because of the high proportion of nuclear and renewable energy sources in their fuel mix. On the other hand, the factors for Greece (0.8299) and Ireland (0.4556) are much higher due to the high proportion of fossil fuels used to generate electricity.

33 All signatories submitting Nationally Determined Contributions (NDCs) in accordance with their commitments arising from the Paris Agreement are promoting the decarbonization of the electricity grid until 2050, including the integration of a higher proportion of renewable and potentially also nuclear energy sources.

of carbon dioxide equivalents per square meter per year).[34] For real estate, it is important to note that other factors such as the occupancy of the property, extended operating hours, or special consumers (e.g. data centers) might make it necessary to normalize performance metrics for specific purposes (see section Normalization for Operational Considerations).

Summary points of section GHG Emissions in the Real Estate Sector:

- Buildings' carbon emissions are most commonly calculated by converting the amount of energy consumed in the asset (kWh) and other GHGs emitted on site into carbon equivalent emission ($kgCO_2e$) with the help of EFs ($kgCO_2e/kWh$).
- Direct emissions occur within the site boundaries (fossil fuels and refrigerant leakages – Scope 1) whereas indirect emissions are released by other actors in a value chain (electricity and district heating/cooling - Scope 2; other indirect emissions – Scope 3).
- GHG emissions released by the built environment can also be differentiated into operational carbon (caused by the energy consumed by building-integrated technical systems during the operation of the building) and embodied carbon (caused by the construction, maintenance and disposal of the building). The guidance and recommendations in this document are focused on operational GHG emissions.
- In the case of real estate, the most common unit of GHG intensity is [$kgCO_2e/m^2/year$] (kilograms of carbon dioxide equivalents per square meter per year).
- GHG intensity will vary between different building types, different building use profiles, different climates and also according to the GHG intensity of local energy markets.

34 UNEP, 2009.; GHG Protocol, 2013, p.173

Guidance and Recommendations

Our recommendations can be differentiated as follows:

- **Shall** – The term "shall" is used to indicate what is required for aligned GHG accounting.
- **Should** – The term "should" is used to indicate a recommendation, often times best practice, but not a requirement.
- **Must** – The term "must" is used to indicate a conditional 'shall'. That is, if a specific condition is met, an additional practice 'must' be completed.
- **May** – The term "may" is used to indicate an optional or permissible action.

Scope attribution

CONSOLIDATION APPROACH FOR FINANCED EMISSIONS

"The GHG Protocol Corporate Standard makes no recommendation as to whether voluntary public GHG emissions reporting should be based on the equity share or any of the two control approaches, but encourages companies to account for their emissions applying the equity share and a control appropriate separately."[35] Thus, in corporate reporting, organizations are encouraged to consistently apply one consolidation approach (equity share, financial control, operational control) throughout their corporate reporting. Please refer to Appendix III for a review of the GHG Protocol consolidation approaches.

However, the accounting of financed emissions requires that asset-level accounting be done in a more standardized manner than allowed for by the Corporate Standard due to the need to aggregate asset-level information. The Scope delineations as applied under the Corporate Standard (see section Corporate GHG Accounting) cannot be used 'as is' in accounting and reporting of financed emissions because the variety of organizational boundaries and consolidation approaches used for corporate reporting results in different Scope attributions for the emissions associated with the same characteristics (e.g. tenant consumption). For example if Real Estate Company A uses the operational control consolidation approach for its corporate reporting, and Real Estate Company B uses the financial control consolidation approach for its corporate reporting, a financial institution with stakes in both that simply sums up emissions by Scope will have an inconsistent view of its emission Scopes. The consequences of this include:

- Compromised comparability, between and within financial institutions
- Room for both double counting and completely missed emissions

To prevent this inconsistency, financial institutions must impose a boundary (see Whole-building approach) and a consolidation approach upon each of the real estate assets in which it invests or to which it provides capital, debt, collateral, etc. In the real estate sector, the operational control approach is most widely used because decisions aiming to energy or carbon assessment are usually directed by buildings characteristics and performance.

35 GHG Protocol, 2004, p.20.

Therefore, for the purposes of delineating emissions Scopes for accounting of financed emissions in the real estate sector, financial institutions **shall** impose an operational control consolidation approach on the real estate assets within their portfolios. This will be the case regardless of the consolidation approach taken by the underlying assets in their individual corporate reporting. This requirement eliminates inconsistencies in accounting that could arise from using the equity share approach, which would require Scope 1 and 2 emissions from all equity investments to be reported under the financial institution's Scope 1 and 2 emissions (according to its share of equity in the operation).

It is understood that financial institutions cannot impose the consolidation approach to be used by its underlying investments in each underlying investments' own corporate reporting efforts. It is the responsibility of the aggregator to ensure that the accounting is done as if all stakeholders in the value chain had used the operational control consolidation approach.

LEASED ASSETS (SCOPE 3, CATEGORY 13)

In the Corporate Standard, emissions from fuel combustion and electricity use of tenants under leasing arrangements can be defined as Scope 1, 2, or 3 depending on the consolidation approach used and type of leasing arrangement.[36] The Scope 3 Standard has a category for emissions from downstream leased assets:

Cat 13. Downstream leased assets: This category includes emissions from the operation of assets that are owned by the reporting company (acting as lessor) and leased to other entities in the reporting year. This category is applicable to lessors (i.e., companies that receive payments from lessees who have the right to use an asset through a contract with the owner of the asset).

If a company's (i.e. lessor) is reporting Scope 3 emissions from downstream leased assets these include the Scope 1 and Scope 2 emissions of lessees (see table [A.2]).

Table [A.2] from Appendix A. ("Accounting for Emissions from Leased Assets") of the Scope 3 Standard[37] clarifies the differentiation:

36 GHG Protocol, 2011, p.124.
37 GHG Protocol, 2011, p.124.

Table A-2 Leasing agreements and boundaries (lessor's perspective)

	Type of leasing arrangement	
	Finance/capital lease	**Operating lease**
Equity share or financial control approach used	Lessor does not have ownership or financial control, therefore emissions associated with fuel combustion and use of purchased electricity are scope 3 (Downstream leased assets).	Lessor has ownership and financial control, therefore emissions associated with fuel combustion are scope 1 and use of purchased electricity are scope 2.
Operational control approach used	Lessor does not have operational control, therefore emissions associated with fuel combustion and use of purchased electricity are scope 3 (Downstream leased assets).	Lessor does not have operational control, therefore emissions associated with fuel combustion and use of purchased electricity are scope 3 (Downstream leased assets)*

SOURCE: GHG PROTOCOL, SCOPE 3 STANDARD (RED BOX ADDED BY AUTHORS)

* Footnote in bottom right cell: some companies may be able to demonstrate that they do have operational control over an asset leased to another company under an operating lease, especially when operational control is not perceived by the lessee. In this case, the lessor may report emissions from fuel combustion as scope 1 and emissions from the use of purchased electricity as scope 2 as long as the decision is disclosed and justified in the public report.

Since the operational control consolidation approach is to be used for the allocation of financed emissions (see Consolidation Approach for Financed Emissions above), tenant-related emissions **shall** be categorized as Scope 3 (category 13) from the perspective of the lessor.[38] That is, the emissions associated with fuel combustion and use of purchased electricity are Scope 3 for the lessor (Downstream leased assets) and emissions associated with fuel combustion at sources in the leased space are Scope 1 and use of purchased electricity are Scope 2 for the tenant.[39]

Regarding multi-tenant properties typically a differentiation must be made between tenant-space (normally controlled by the tenant) and common-space (controlled by the landlord). Since Appendix A. explicitly differentiates between emissions from "sources IN the leased space" it must be assumed that common space and related emissions are therefore out of the tenant control and must be under the "operational control" of the landlord. Therefore, emissions in that space are Scope 1 and 2 for the owner and (proportional) Scope 3 for the various tenants.

Except in the case of owner-occupied buildings (see Direct and indirect financed emissions section above), there will always be to some degree shared responsibilities regarding necessary efforts to reduce carbon emissions, either on a behavioral or technical level. GHG emissions from tenant energy consumption might be Scope 3 from a landlord's perspective, but the landlord should still take responsibility to propose major retrofit measures regarding lighting, cooking equipment, etc.

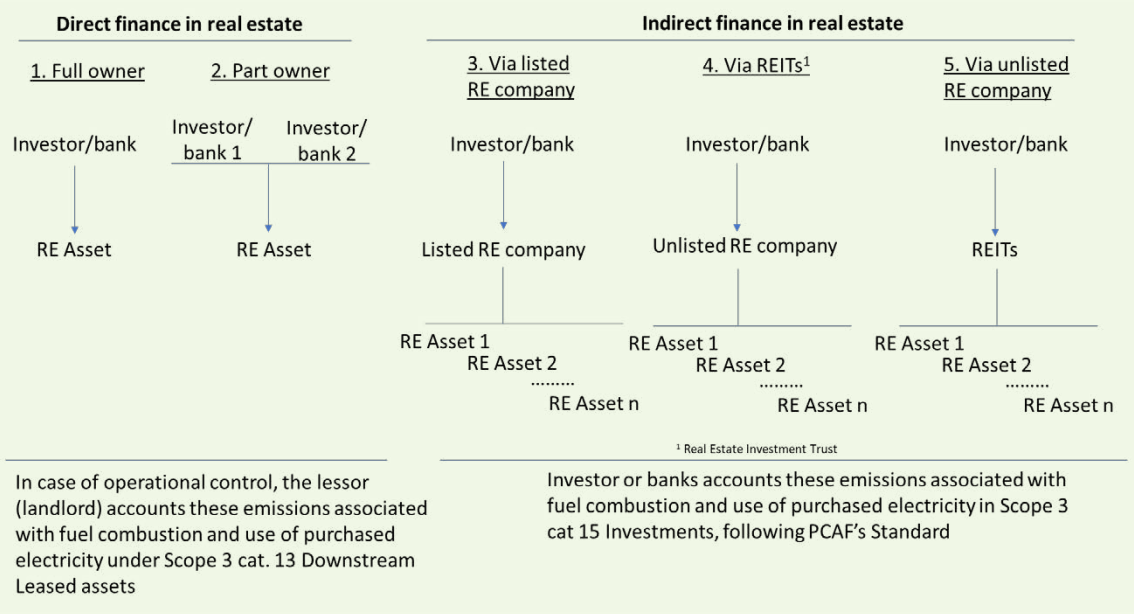
38 Note that for organizations using an operational control approach with an operating lease: "Some companies may be able to demonstrate that they do have operational control over an asset leased to another company under an operating lease, especially when operational control is not perceived by the lessee. In this case, the lessor may report emissions from fuel combustion as Scope 1 and emissions from the use of purchased electricity as Scope 2 as long as the decision is disclosed and justified in the public report." GHG Protocol, 2011. Pg.125

39 GHG Protocol, 2015, p. 34: "Therefore, if a company is a tenant in a leased space or using a leased asset and applies the operational control approach, any energy purchased or acquired from another entity (or the grid) shall be reported in Scope 2."

DIRECTLY AND INDIRECTLY FINANCED EMISSIONS

There are many ways in which various types of financial institutions can finance and invest in real estate, and this has implications for how emission Scopes are to be allocated within the reporting of each stakeholder. Figure 3-1 provides an overview of potential types of real estate loans and direct as well as indirect investments.

FIGURE 3-1: OPTIONS FOR FINANCIAL INSTITUTIONS TO FINANCE REAL ESTATE



SOURCE: PCAF

For owner-occupied properties, direct emissions are Scope 1 and indirect emissions from energy procurement must be reported as Scope 2. These emissions are not considered financed emissions, as the properties are for use as opposed to investment.

For directly financed real estate (scenarios 1 and 2 in Figure 3-1), financial institutions **shall** abide by the GHG Protocol's treatment of downstream leased assets for the leased floor area under the operational control approach. Consequently, for floor area that is not leased (base building and vacant space), building-related emissions fall into the financial institution's Scope 1 and 2 emissions. For scenario 2, the emissions of the building (Scopes 1, 2, and 3) are to be allocated to the financial institutions in proportion to the equity share of the financial institution. These treatments apply also to the "listed real estate company", "unlisted real estate company", and "REIT" in scenarios 3, 4, and 5 of Figure 3-1.

For indirectly financed real estate (scenarios 3, 4, and 5 in Figure 3-1), financial institutions (investors/banks) **shall** include all underlying real estate emissions under its Scope 3 emissions, specifically category 15 (investments). As per the GHG Protocol:[40]

Cat 15. Investments: This category includes emissions associated with the reporting company's

40 GHG Protocol, 2011.

investments in the reporting year, not already included in Scope 1 or Scope 2. This category is applicable to investors (i.e., companies that make an investment with the objective of making a profit) and companies that provide financial services. Investments are categorized as a downstream Scope 3 category because the provision of capital or financing is a service provided by the reporting company. Category 15 is designed primarily for private financial institutions (e.g., commercial banks), but is also relevant to public financial institutions (e.g., multilateral development banks, export credit agencies, etc.) and other entities with investments not included in Scope 1 and Scope 2.

Notably, the GHG Protocol states that a "reporting company's Scope 3 emissions from investments are the Scope 1 and Scope 2 emissions of investees."[41] However, for the purposes of accounting for financed emissions of real estate, the financial institutions' investment Scope 3 emissions **shall** not only include the Scope 1 and 2 emissions of its underlying real estate companies and REITs, but also their building-related Scope 3 emissions; that is, the building-related emissions of leased spaces. The emissions of the real estate companies and REITs (Scopes 1, 2, and 3) are to be allocated to the financial institutions that invest in them in proportion to the equity share of the financial institution. This ensures that the whole-building approach is followed throughout the investment value-chain (see Whole-building approach section below) and allows the investment portfolios to meaningfully compare their performance against relevant sectoral targets.

41 GHG Protocol, 2011.

Whole-building approach

GHG accounting and reporting initiatives often limit reporting to the boundaries defined from the reporting organizations' perspective, measuring their financial and non-financial performance (including risk management) within these boundaries. However, while "ownership" of emissions reported as Scope 1 and 2 directly reflect risk in the real estate sector, some tenant-related emissions can still constitute a significant source of risk borne by the landlord/investor because some transition risk depends on a building's GHG performance in relation to regulatory requirements and market expectations, regardless of how electricity is sub-metered within the building and the resulting implications for the allocation of emissions 'ownership'.

Furthermore, while an investor who owns a portion of a particular building does not necessarily bear the full transition risk, it will still be necessary to quantify the total emissions from the entire building, irrespective of who has the capacity to control these emissions, in order to assess their portion of the overall risk.

Financial institutions **shall** include all emissions from the entire building in GHG accounting (whole building approach). This requires the quantification and assessment of all GHG emissions of buildings in operation, irrespective of the organizational boundaries or control approaches used by various stakeholders in their corporate reporting. This is referred to as the "whole building approach".

Furthermore, financial institutions **shall** delineate (within their Scope 3 emissions), the Scope 1, 2, and 3 emissions of the real estate operations. This means that the emissions resulting from landlord or building manager-controlled spaces **must** be separated from tenant-related building emissions. This is important in disaggregating and understanding the various drivers of transition risk, where they come from, and how they can be addressed.[42] If tenant data cannot be collected, please refer to the guidance on Estimation of incomplete data.

The PCAF Standard states "For property already built, financial institutions **shall** cover the absolute Scope 1 and 2 emissions related to the energy use of financed buildings during their operation (energy use includes the energy consumed by the building's occupant and shared facilities)."

The whole-building approach is aligned with the GHG Protocol Scope 3 Standard pertaining to the investment-specific method of reporting investments, in which investors should collect:

- Scope 1 and Scope 2 emissions of investee company
- The investor's proportional share of equity in the investee
- If significant, companies should also collect Scope 3 emissions of the investee company

42 There are three types of tenant emissions in a building: (1) Emissions from tenant use of lighting and HVAC consumption, as well as any refrigerant use built into the building; all of these are related to the building's transition risk. (2) Emissions from tenant use of gas or other fuels provided by the building infrastructure; this is a clear transition risk for the building owner, as it is related to building infrastructure. (3) Emissions from tenant plug loads; these do not necessarily constitute a source of transition risk, as it is related to what the tenant does, provided the tenant has the choice of electricity source. This changes, however, if the electricity is provided by the building owner through an embedded network, or if local regulation focuses on emissions at the building level.

Here, any emissions from the building that are categorized as Scope 3 are deemed significant and are to be included in the accounting. This is also aligned with the update to the TCFD recommendations that organizations in all sectors "include disclosure of relevant, material categories of Scope 3 emissions".[43] Again, in real estate, all building operations-related emissions are deemed to be relevant and material.

Furthermore, for the purpose of aligning the (financed) emissions of real estate portfolios with net-zero frameworks and commitments, both the UN-convened Net-Zero Asset Owner Alliance (NZAOA) and the Institutional Investors Group on Climate Change (IIGCC) as well as the SBTi recommend the inclusion of building-related tenant emissions in the setting of and compliance with targets, regardless of their categorization as Scope 3 emissions in most instances of corporate reporting and target setting.[44] [45]

If financial organizations have the data to split the whole building into base building and tenant related loads (which together is the whole building) they **should** separate.

Operational and embodied carbon

For standing real estate assets, the operational emissions (those originating from operational energy use, life cycle module B6 according to EN 15978) **shall** be reported.

In-use embodied carbon – including maintenance, repair, and retrofit measures – **shall** be tracked and reported. In order to guarantee a net positive environmental benefit of a retrofit, it is imperative to ensure that the embodied carbon emitted as a consequence of the retrofit is taken into account in addition to the reduction in operational carbon emissions it enables. In practice, the maintenance, repair, and/or retrofit of a building often does not occur annually, but rather sporadically. For reporting of financed emissions, the in-use embodied carbon **shall** be reported for the respective year. Given that maintenance, repair and retrofits are unlikely to happen in the same year for all assets in a portfolio, the reported in-use embodied carbon is unlikely to cause a spike in a given year. In-use embodied carbon **should** be clearly delineated from operational emissions. If it cannot be separated, it **must** be included in the operational carbon and made clear in the reporting.

Financial institutions **should** also report on upfront embodied carbon, and it is strongly recommended that they do so. If it is, it **must** be reported separately from operational emissions and categorized using EN 15978. Note that the embodied carbon emitted in the past (upstream) for the construction of a building does not imply transition risk on the standing investment moving forward.

This document does not provide guidance on the transference of upfront or in-use embodied

43 TCFD has determined that data and methodologies have matured sufficiently such that Scope 3 disclosure is appropriate for all financial and non-financial sectors. Disclosure is particularly important for organizations for which Scope 3 emissions account for 40% or more of the total emissions of the organization or for which Scope 3 emissions have been deemed a significant risk in their value chain." (TCFD, 2021)

44 NZ AOA, 2021.

45 IIGCC, 2021.

carbon into 'annuities' for the purposes of transition risk management or net-zero commitment alignment, but rather is limited to the annual reporting of financed emissions. It is expected, with the development and growing availability of frameworks and tools for the calculation of the embodied carbon of buildings, that reporting on embodied carbon (alongside LCA and Whole-life-carbon assessments) will become more important in the future, particularly for new construction.

Location-based and market-based methods

ELECTRICITY

There are benefits and drawbacks of both the location- and market-based methods. Table 3-1 provides a corresponding summary for the real estate sector.[46]

TABLE 3-1: MAJOR BENEFITS AND DRAWBACKS OF THE LOCATION-BASED AND MARKET-BASED METHODS FOR GHG REPORTING IN REAL ESTATE

	Location-based	Market-based
Benefits	**Benefits to financial institutions** • Provides more comparability on energy performance, when isolated to a single region, without the need to translate GHG performance back into energy performance **Benefits to low-carbon transition** • Incentivizes directly energy reduction and energy efficiency measures • Incentivizes directly on-site renewable energy generation	**Benefits to financial institutions** • Allows for credible use of off-site renewable energy to progress towards net-zero goals[47] **Benefits to low-carbon transition** • Incentivizes use of/switch to low-carbon energy options (including both on-site and off-site renewable energy) by landlord and tenants • Incentivizes energy reduction and energy efficiency measures (and becomes more practical as renewable energy prices rise)
Drawbacks of relying on a single method	**Drawbacks to financial institutions** • Does not account for active renewable energy procurement via the grid, which is invariably a part of any net-zero initiative, framework, or commitment for real estate **Drawbacks to low-carbon transition** • Could remove accounting incentive for renewable energy purchasing and, consequently, reduce the demand signal in renewable energy markets and the amount of renewable energy on the grid • Could result in freeloading on grid decarbonization actioned by the energy sector, and decreased incentive for energy reduction measures	**Drawbacks to financial institutions** • In the absence of robust residual EFs (as in some less sophisticated energy markets), market-based methods could potentially lead to double-counting of renewable energy use **Drawbacks to low-carbon transition** • Could potentially lead actors to emphasize their use of low-carbon energy procurement options at the expense of pursuing energy reduction and energy efficiency measures[48]

To report GHG emissions in the real estate sector, financial institutions **shall** report using both

46 For a more detailed account of the benefits and drawbacks of the location-based and market-based reporting methods, please refer to the GHG Protocol Scope 2 Guidance (GHG Protocol, 2015).

47 Credible and verifiable contractual instruments must be used to preclude double-counting of renewable energy use and to prohibit greenwashing from financial institutions..

48 Sophisticated markets overcome this drawback through effective energy benchmarking and disclosure.

the location-based method and the market-based method. GHG emissions **shall** be reported separately for each method. When either method is used improperly, when methods are mixed, or when information is aggregated between assets or portfolios that use different methods, the resulting information is compromised. Financial institutions **must not** aggregate data collected via different methods. Furthermore, for the market-based method, the Scope 2 Quality Criteria **shall** be used (see Appendix III), as defined by the Scope 2 Guidance.[49] In the case that market-based GHG data cannot be reported, this **must** be disclosed along with the reasons and plans to rectify the inability. These recommendations are in line with both the Scope 2 Guidance and the EPRA Sustainability Best Practice Recommendations (sBPR).[50] Furthermore, if a financial institution's target setting (for net zero commitments or otherwise) include the use of off-site renewable energy, thus leveraging market-based emissions accounting, then the present reported GHG emissions **must** also be calculated using the market-based method for consistency.

Dual reporting in this manner incentivizes both reductions in energy consumption (primarily via the location-based method) and, for the remaining energy consumption, procurement of renewable energy (primarily via the market-based method). It also provides financial institutions with a greater understanding of the decarbonization strategies of their real estate management. GHG emissions calculation using the location-based method is particularly useful in transition risk assessment because it allows for a more consistent basis for the comparison of buildings' energy use mix and efficiency. GHG emissions calculation using the market-based method is particularly useful for determining manager decision-making regarding GHG emissions reduction decoupled from the impact of average jurisdictional grid decarbonization.

It is acknowledged that market-based method requires the collection of more data (regarding contractual instruments, residual emissions factors, etc). However, the Scope 2 Guidance outlines how to deal with varying levels of access to particular data. Importantly, if no data is available, the market-based method output will be the same as that produced by the location-based method. Equal location-based and market-based GHG emissions therefore signals that the reporting entity does not have the data collection processes or expertise in place to be able to handle market-based reporting. With the development and growing availability of residual EFs used in the market-based method, as well as the continued production and tracking of high-quality energy attribute characteristics for the purpose of credible alignment with various net-zero frameworks, it is expected that market-based GHG emissions reporting will become easier in the near future.

DISTRICT HEATING AND COOLING

The differentiation between location-and market-based accounting of GHG emissions is most relevant for electricity. Nevertheless, district heating and cooling abides by the same corporate accounting as electricity.

Where possible, the location-based EF used for district heating (or water cooling) **should** be

49 Since the Scope 2 Guidance amendment to the Corporate Standard was published in 2015, companies are recommended to report separately on both location-based and market-based Scope 2 GHG emissions.

50 EPRA Sustainability Best Practice Recommendations (sBPR) define the location-based method as the minimum reporting requirement and allow for reporting using the market-based method as an "additional performance measure". (EPRA, 2017)

provided by the local provider.[51] This is because EFs for district heating (cooling) can vary significantly[52] and because the building owner or occupant cannot procure a different source of district heating (like they can for electricity). In many cases, this means that the best location-based EF is likely to be the market-based EF – i.e., for district heating and cooling, the market-based EF **may** be used as the most granular and preferred location-based EF. In the absence of such a locally-specific EF, a higher-level (national) location-based EF **may** be used.[53]

In either case, the choice of EF **shall** be disclosed. Importantly, as with GHG accounting resulting from electricity use, financial institutions **must not** aggregate emissions data collected via different methods (location-based and market-based).

Location-based emission factors

When using the location-based method to calculate GHG emissions from purchased electricity in real estate, the national grid electricity EFs **should** account for transmission and distribution (T&D) losses as well as trade effects of electricity exports and imports between countries – i.e., they should not be solely based on the energy generation mix of the country.[54]

In measuring building energy consumption, financial institutions **shall** refer to the so-called 'final energy' procured, which can be read off electricity meters and utility bills, in contrast to primary energy, which indicates how much energy was used in the generation of electricity at the source by burning fossil fuels like oil and gas. The difference between final energy and primary energy is a result of conversion, and T&D losses. Generally, the relationship between these two figures is expressed with so-called primary energy factors, which vary between different energy sources like electricity or gas.

Experience in areas with decarbonizing grids shows that seasonal, daily, and hourly variation in location-based emissions factors become critical to understanding real-world Scope 2 emissions. Where possible, emissions **should** be calculated using time-resolved emissions factors.

Estimation of incomplete data

For the purposes of accounting for financed emissions, financial institutions **shall** report GHG emissions based on actual energy consumption. When energy consumption data is not available for the entire portfolio, the remainder **should** be estimated. If estimation of energy consumption is needed, financial institutions **must** track and disclose how much energy data, and subsequently how much GHG data, was estimated, as well as the estimation methods applied for the calculation. If estimates are not included in the calculation of GHG emissions and the energy consumption data is incomplete, the actual data coverage **must** be disclosed. FI's that rely on estimated data

51 "Such systems provide energy to multiple consumers, though they often have only one generation facility and serve a more limited geographic area than electricity grids." GHG Protocol, 2015, p. 37

52 District heating provided by renewable energy sources might have an EF of close to zero, whereas district heating provided by burning garbage can have an EF of well above 0.5.

53 A database of heating and cooling EFs can be found within the GHG Protocol's GHG Emissions Calculation Tool (beta version). GHG Protocol, 2021.

54 GHG Protocol Scope 2 Guidance, 2015.

should include a strategy to collect real data and replace estimated data with real data in the coming years.

For the purposes of transition risk assessment, whole building data covering a full year is required for a meaningful comparison against decarbonization pathways. In this case, if data for the whole building covering a full year is not available, estimates **must** be used, and stakeholders **must** track and disclose the share of estimated GHG data as well as the estimation methods applied.

Estimation from incomplete floor area data coverage

If complete energy consumption data associated with the whole building is available, then the associated GHG emissions can be readily calculated and allocated to their respective Scopes (see Whole-building approach & Scope allocation). However, if energy consumption data is not available, or only partially available, for any specified floor area, then financial institutions **should** estimate the energy consumption of the unavailable floor area in order to have a complete picture of GHG emissions of the whole building. These emissions **may** be allocated into their respective Scopes if data on the operational control and energy sources of the estimated energy consumption is available.

When estimating data, it is important to consider that energy consumption patterns can vary significantly between common areas and tenant spaces. Thus, if the breakdown of energy consumption between common areas and tenant spaces (and shared services) is available and data is available for some spaces but not others, then remaining energy consumption values **should** be estimated separately per floor area to calculate the remaining emissions. However, if the area breakdown between different floor area types is not available, then estimations may be made at the whole-building level in accordance with the PCAF data quality hierarchy (see Quality assurance and verification).

ESTIMATION FROM INCOMPLETE DATA WITHIN THE PERIOD OF OWNERSHIP

If the period for which energy consumption data (and the corresponding emissions calculations) covered is shorter than one year (due to acquisition, sale, or other reasons), estimation might be beneficial for some purposes. If calculating absolute emissions for reporting purposes, only the emissions during the period of ownership need be calculated. If energy consumption data for the full period of ownership is not available, then the energy consumption during the period of ownership **should** be estimated. If energy consumption is estimated for uncovered time during the period of ownership, or extrapolated for the full year if ownership data is just available for a limited time, then the estimated energy consumption **should** be normalized for seasonal variation (see Normalization of energy consumption based on climatic conditions).

Modifying energy consumption based on climatic conditions

There is a wide range of climatic regions globally, each with very different demands on the thermal quality of buildings, thus resulting in a different energy consumption required to achieve identical indoor comfort levels. In the comparison of energy consumption data, as well as of the corresponding energy and GHG intensities, one might wish to understand that data in the

context of the local climatic conditions during the reporting year or period for which the data was recorded.

For financed emissions reporting, weather normalization **shall** not be applied, as the reporting is meant to reflect what happened in actuality, not in an 'average' year.

However, weather normalization **may** be used to improve like-for-like comparisons. Furthermore, decisions regarding the energy efficiency efforts of individual buildings (e.g. evaluating transition risk) **may** incorporate these methods since the weather conditions in a particular year might not accurately reflect a particular building's inherent qualities and since climate change will have a very different effect on heating- and cooling-related energy demands and consequent projections of carbon emissions.

A common method for normalizing heating and cooling demands of buildings makes use of Heating Degree Days (HDD) and Cooling Degree Days (CDD) indices[55] -- weather-based technical indices designed to describe the need for the heating energy and cooling (air-conditioning) requirements of buildings, respectively. Eurostat provides a technical definition and detailed requirements for their use.[56]

Information on average heating- and cooling-related weather and climate conditions at specific locations **may** be used for the assessment of buildings' carbon performance in three ways: (1) estimating energy consumption during periods for which energy data is not available, (2) normalizing weather conditions in the year of assessment and (3) estimating the effect of climate change on future heating and cooling demand.

(1) Estimating energy consumption during periods for which energy data is not available

If energy data is not available for a particular time period, normalization of estimated remaining energy data **may** be based on the ratio between the HDD (or CDD) for the period of estimated energy data and the HDD (or CDD) of measured energy data.

(2) Normalizing weather conditions in the year of assessment

Another application of HDD and CDD is the normalization of energy demand and consequent GHG emissions based on the actual consumption data for a year. If the measured values originate from a year with rather mild winter months, a low actual heating demand will not reflect the real thermal quality of the building.

Normalization in this manner **may** be used for various time-series analysis benchmarking and risk management exercises. However, as stated above, normalization of actual measured energy **shall** not be done for reporting purposes.

This method is more reliable for normalizing actual energy demand to an estimation of general performance than other approaches that are for example based on the

55 Petri et al, 2015, p. 10.
56 Eurostat, 2019.

mean outdoor temperature only.[57] Since heating demand usually has good correlation to the indoor-to-outdoor temperature difference and a building's heat loss coefficient (dependent on building fabric and air infiltration), there is also a good correlation between heating demand and HDD, as the latter reflect these temperature differences.[58] Local 30-year average HDD and CDD values can be derived from reanalysis data and used in the construction of a relevant HDD or CDD ratio.

(3) Estimating the effect of climate change on future heating and cooling demand

Climate change will have a significant impact on future heating and cooling energy demand. HDD and CDD values can also be used to consider this impact when estimating a building's future GHG emissions. This can be done by comparing projected HDD or CDD values against historical benchmarks – e.g. projecting energy consumption against a modified HDD/CDD. This is particularly relevant for district heating and cooling if this is how the building regulates its temperature. Thus, this kind of normalization is especially relevant for risk assessment.

Projected heating and cooling energy demand using HDD/CDD modifications **may** be used for science-based target setting. If it is used for such a purpose, then the construction of the HDD and CDD ratio projections **must** be disclosed in detail, including information on the datasets and projections use, as well as how and to what building performance variables the ratios were connected.

Normalization for operational considerations

Properties often have vacant space — i.e., are not fully occupied.

Reporting of financed emissions **shall** reflect the actual performance, irrespective of occupancy. (Normalization for vacant space or other occupancy-based considerations **shall** not be used in reporting of financed emissions.)

However, for applications in which like-for-like comparisons are important, such as benchmarking as well as any kind of transition risk assessment, it is useful to normalize GHG intensity metrics to account for vacant space. Intensities derived from consumption data of partially vacant buildings using the entire building floor areas as the basis for the intensity calculations could be misleading since they imply better efficiency than actual performance.

Therefore, normalization **may** be applied in the following situations: benchmarking, target setting and risk management. If normalization is applied, 'average annual vacancy' **should** be used. Furthermore, if this normalization is applied to target-setting, then the normalization **must** be applied upwards. That is, vacancy **may** be assumed to go down (increasing future energy demand), but vacancy **may** not be assumed to go up (decreasing future energy demand).

There might be cases in which further normalization is useful for contextualizing and

57 Day, 2006.
58 Day, 2006.

benchmarking use-intensity or running hours (e.g., 24/7 operations) in comparison with the average property of this use-type. Companies **may** apply appropriate normalization techniques for these situations and **must** clearly state the reason and applied methods.

Fugitive emissions

As per the Scope 3 Standard, GHG emission calculations and tracking **shall** include fugitive emissions. These include the F-gases described in the GHG Emissions in the Real Estate Sector section of this report, and reporting includes tracking the type of gas leakage in kilograms (kg), the corresponding time period over which the emissions occurred, and converting the kilograms of the GHGs into CO_2-equivalents using official EFs such as those provided in the IPCC and GHG Protocol.[59] When fugitive emissions are relevant and material (i.e. above 5% of the portfolio), FIs **shall** track and disclose these emissions separately. Additionally, they **shall** disclose the methodology used to calculate fugitive emissions, included any assumptions or estimations as appropriate.

If FIs do not track and disclose fugitive emissions, they **shall** disclose why they did not do so, their plans assess the materiality of fugitive emissions in their real estate portfolios, and their plans to collect and disclose this information in the future.

In practice, the refilling of gases often does not occur annually, but rather every few years. Therefore, the reality of losses occurs throughout that period. For reporting of financed emissions, the data **shall** be reported for the respective year. Given that gas refilling, and the corresponding logging of reported losses, is unlikely to happen in the same year for all assets in a portfolio, the reported losses are not likely to cause a spike in a given year.

For other purposes, it **may** be more informative to annualize the overall amount and allocate the figure to the entire period covered – e.g., the refill equals 7.0 kg and a refill takes place for the first time in 2.5 years, then the annual figure would be 2.80 kg. This normalization **may** be applied for benchmarking and transition risk purposes to provide less variable and more informative asset-level insights.

It is likely that reporting fugitive emissions will become more important for GHG accounting in the real estate sector in the future since F-Gases (HFCs and PFCs) play an important role in the building sector.[60]

59 GHG Protocol, WRI, 2021.

60 European Environment Agency: National greenhouse gas inventories (IPCC Common Reporting Format sector classification), 2021. / J.G.J. Olivier and J.A.H.W. Peters: Trends in global CO_2 and total Greenhouse Gas Emissions 2020 report, 2020. / United States Environmental Protection Agency: Greenhouse Gas Data Tool, 2022.

Gross electricity and net-energy demand

In cases where renewable energy (e.g. with solar panels) is generated on site, this energy can either be consumed on-site or excess energy might be sold back to the grid. "Determining the underlying activity data (in MWh or kWh) in these systems may be challenging given the flux of electricity coming in or flowing out."[61]

FIGURE 3-2. COMPARING GROSS AND NET ENERGY CONSUMPTION

Total energy production from on-site system	On-site energy consumption from on-site system	Energy exported from the on-site system to the grid	Energy imported from the grid
100 kWh	50 kWh	50 kWh	70 kWh
Total energy consumption (to be reported separately) = 120 kWh 50 kWh consumed from on-site system + 70 kWh imported from grid			
"Net" grid consumption= 20 kWh (70 kWh imported from grid - 50 kWh exported)			

Source: GHG Protocol, 2015.

The guidance herein follows that of the Scope 2 Guidance, "For accurate Scope 2 GHG accounting, companies **shall** use the total—or gross—electricity purchases from the grid rather than grid purchases "net" of generation for the Scope 2 calculation. A company's total energy consumption would therefore include self-generated energy (any emissions reflected in Scope 1) and total electricity purchased from the grid (electricity). It would exclude generation sold back to the grid."[62] Additionally, "If a company cannot distinguish between its gross and net grid purchases, it **should** state and justify this in the inventory."[63]

This "gross" perspective would result in a number for proper GHG reporting which is derived based on the 70 kWh imported from the grid as illustrated in figure 3-2 above. Since the renewable energy produced and consumed on-site has an EF of nearly zero, this energy contributes to the energy intensity of the building, but will not affect the building's GHG intensity.

For the purposes of measuring transition risk or claiming the operational "climate neutrality" of building, there are frameworks that allow for the use of "net energy demand." Net energy demand refers to the difference between energy imported from the electricity grid and energy exported back onto the grid from on-site renewable energy generation that is not immediately consumed. The possibility to sell renewable energy to the grid could be a factor – in other words the property with surplus PV capacity could be better positioned (e.g. has the option to store the energy possibly in the future via batteries or sell credits etc.). Here, energy consumption and intensity figures are still the same, but, in contrast to Scope 2 calculation, the electricity generated on site and pushed to the electric grid are deducted from a building's GHG emissions. This figure therefore reflects the balance of energy imports and exports, and is *not* identical with a building's energy consumption nor the procured energy. For carbon-risk-management where the actual imports and exports are not measured individually and cannot be disaggregated, this approach **may** be applied, although it **must** be stated clearly that the net energy demand is used in lieu of gross electricity.,

61 GHG Protocol, 2015.
62 GHG Protocol, 2015.
63 GHG Protocol, 2015.

Quality assurance and verification

To ensure reliability and validity of the resulting (in-use) carbon intensity of properties, the entire carbon accounting process, methodology, and underlying input data **should** be audited and verified. In alignment with industry standards an audit **must** provide at least a limited level of assurance, but financial institutions are encouraged to provide a reasonable level of assurance. Certified data is more reliable compared to self-declared statements.

Following auditing requirements, current financial and ESG reporting standards base most of their disclosure requirements on verifiable current and past data and request calculations to be based on specific accounting methodologies and protocols. Reporting actions require data from the last few years as well as the baseline year in order to monitor compliance with commitments and targets.

There is often a lag between financial reporting and required data, such as emissions data for the borrower or investee becoming available. In these instances, financial institutions **should** use the most recent data available even if it is representative of different years, with the intention of aligning as much as possible. Based on the data available, the following hierarchy is proposed in order of preference (1 being the best score and 5 being the worst score):

TABLE 3-2: DATA QUALITY SCORE TABLE FOR COMMERCIAL REAL ESTATE

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

Note that each portion of a building's emissions may have a different score according to the table above. For instance, if the energy consumption for a building's common area is known and is multiplied by it's set of appropriate average EFs to achieve a Score 2, and the energy consumption fort hat same building's tenant space is estimated based on the building type and location specific statistical data and floor space resulting in emissions data with a Score of 4, then the aggregate emissions oft he entire building would be the weighted average (by emissions mass) of the scores 2 and 4.

Floor space measurement

MEASUREMENT SCHEMES

As floor area is used in the estimation of intensity-based indicators, parameters on appropriate floor area measurement must be specified. There are numerous floor area schemes, including Gross Floor Area (GFA), Gross Internal Area (GIA), Gross External Area (GEA), Net Internal/ Lettable Area (NIA/NLA), and Gross Lettable Area (GLA). These descriptions are commonly used globally, although they differ from each other. Most countries, the SBTi, GRESB, and the International Energy Agency (IEA) use GFA. However, some countries (including Australia, New Zealand, United Kingdom and Hong Kong) use Net Lettable Area (NLA) as standard practice for measuring assets.

The International Property Measurement Standard (IPMS) aims to establish a globally consistent methodology for property measurement. IPMS 2: Office states: "The sum of the areas of each floor level of an office Building measured to the Internal Dominant Face and reported on a Component-by-Component basis for each floor of a Building. It is in many markets […] known as Gross Internal Area"[64] (GIA)). IPMS 2: Residential states: ("The sum of the areas of each floor level of a Building measured to the Internal Dominant Face, which may be reported on a Component-by-Component basis for each floor of a Building. This is known in many markets as Gross Internal Area"[65] (GIA))"). CRREM refers to IPMS 2 schemes.

Financial institutions **shall** disclose the method by which they aggregate emissions based on various data reported to them. For absolute emissions, it is simply a matter of addition and attribution. For the calculation of intensities, which require a consistent floor area definition as a denominator, the floor area definition used **should** be used as consistently as possible throughout their GHG accounting. Financial institutions **should** use the International Property Measurement Standard (IPMS), specifically IPMS 2: Office or Residential to determine the asset floor area. For any reporting and accounting using floor area descriptions, their use and divergence from IPMS 2 **must** be explained.

According to the Royal Institution of Chartered Surveyors (RICS), IPMS 2 "compares closely, but not exactly, to the GIA measurement under the Code of measuring practice." Details on conversion of GIA to IPMS 2 can be found in the RICS global guidance on property measurement.[66]

64 IPMS Coalition: Office buildings, 2014.
65 IPMS Coalition: Office buildings, 2014.
66 Section 3.2.3 (RICS, 2018).

GRESB uses the term GFA, which, while closely aligned to IPMS 2 (International Property Measurement Standards) specifications, is less prescriptive. GRESB guidance states that GFA "can exclude outdoor/exterior areas as well as indoor parking," with specific rules pertaining to the inclusion or exclusion of indoor parking that depend on the particular asset.[67] In line with the guidance above, if unable to use a stricter definition, such deviations **must** be disclosed.

It should be noted that the difference between GFA and NLA refers to a building's Common Areas, most often unknown by building owners tracking NLA only. While this difference does not impact the adherence to the PCAF Standard for buildings with actual building energy consumption for the entire building, it does affect the calculation of building emissions for those methods that estimate energy consumption using floor area (Table 3-2: Data quality score table for Commercial Real Estate, options 2a and 2b). In such cases, conversion factors **must** be applied to arrive at IPMS floor areas. Property type-specific floor area ratios **may** be used together with the relevant data to estimate IPMS floor area. GRESB has provided a range of commonly used ratios per property type.[68]

Furthermore, if the reporting entity can justify that the building type and location-specific statistical data used is based upon NLA (that is, if the building type and location-specific energy intensities used are derived from whole-building energy consumption and NLA as opposed to GFA), then the reporting entity **may** use that building type and location-specific statistical data in combination with the NLA floor area to estimate its whole-building energy consumption in accordance with the PCAF data quality hierarchy. This corresponds to options 2a and 2b of Table 3-2: Data quality score table for Commercial Real Estate, option 3.

PARKING

Emissions associated with parking areas **shall** be included in the absolute calculations of financed emissions. When calculating the financed emissions intensity of a building or portfolio, parking **should** be reported separately. If the energy consumption of a building's parking cannot be disaggregated from the energy consumption of the building, then the emissions **must** be included in the latter. This means that when calculating emissions intensity, the cumulative energy consumption from both the building and its parking will be divided by the floor area metric used, without the parking area. While potentially inflating the energy intensity of the building, this precludes the artificial lowering of a building's GHG intensity solely due to inflation of the floor area denominator with parking space.

67 "Indoor parking can also be excluded only if the participant intends to represent parking as a separate property type and report the asset as such. However, if indoor parking is metered together with the central part of the asset, it should be included." (GRESB, 2019).

68 See Appendix 3a of the 2020 GRESB Real Estate Reference Guide, 2020.

Aggregating GHG intensities

The calculation of GHG intensity is described in the GHG Emissions in the Real Estate Sector. Asset-level GHG intensities **shall** be aggregated to portfolio-level (or multi-asset) GHG intensities by taking the floor area-weighted average of the asset-level intensities. Furthermore, financial institutions **shall** weight the contributions of each of their underlying property intensities by their financial share in each property when calculating a portfolio-level intensity.

Target setting

To be able to contextualize their GHG emissions performance in line with net-zero goals or the ambitions of the Paris Agreement, financial institutions **should** set decarbonization targets to compare their resulting carbon intensities against science-based pathways.

In the projection of future building performance to comply with science-based targets, financial institutions **may** also incorporate foreseeable trends in grid decarbonization. These scenarios imply decreasing Scope 2 emissions per unit of consumed electricity, contributing to the achievement of sectoral decarbonization targets. Projected EF's **should not** rely solely on policy statements or normative scenarios of future development, but rather on a robust and plausible forecast of predicted development, which **may** of course consider publicly communicated policy statements in their construction. The reason for this is that some policy statements amount to wishful thinking without concrete plans attached to them.

Summary points of section Guidance and Recommendations:

- **Scope attribution**: For the purposes of delineating emissions Scopes for accounting of financed emissions in the real estate sector, financial institutions **shall** impose an operational control approach on the real estate assets within their portfolios. Tenant-related emissions shall be categorized as Scope 3 (category 13) from the perspective of the lessor. For directly financed real estate, financial institutions shall abide by the GHG Protocol's treatment of downstream leased assets for the leased floor area under the operational control approach. For indirectly financed real estate, financial institutions (investors/banks) shall include all underlying real estate emissions under its Scope 3 emissions, specifically category 15 (investments). For the purposes of accounting for financed emissions of real estate, the financial institutions' investment Scope 3 emissions shall not only include the Scope 1 and 2 emissions of its underlying real estate companies and REITs, but also their building-related Scope 3 emissions; that is, the building-related emissions of leased spaces.
- **Whole-building approach**: Financial institutions **shall** include all emissions from the entire building in GHG accounting (whole building approach). This requires the quantification and assessment of all GHG emissions of buildings in operation, irrespective of the organizational boundaries or control approaches used by various stakeholders in their corporate reporting. This is referred to as the "whole building approach". Furthermore, financial institutions **shall** delineate (within their Scope 3 emissions), the Scope 1, 2, and 3 emissions of the real estate operations. This means that the emissions resulting from landlord or building manager-controlled spaces **must** be separated from tenant-related

building emissions.

- **Operational and embodied carbon**: For standing real estate assets, the operational emissions **shall** be reported. Additionally, in-use embodied carbon including maintenance, repair, and retrofit measures **shall** be tracked and reported for the respective year. In-use embodied carbon **should** be clearly delineated from operational emissions. If it cannot be separated, it **must** be included in the operational carbon and made clear in the reporting. Financial institutions **should** also report on upfront embodied carbon, and it is strongly recommended that they do so. If it is, it **must** be reported separately from operational emissions and categorized using EN 15978.
- **Location-based vs. market-based method**: To report GHG emissions in the real estate sector, financial institutions **shall** report using both the location-based method and the market-based method. GHG emissions **shall** be reported separately for each method. Financial institutions **must not** aggregate data collected via different methods. Furthermore, for the market-based method, the Scope 2 Quality Criteria **shall** be used (see Appendix III), as defined by the Scope 2 Guidance. Where possible, the location-based EF used for district heating (or water cooling) **should** be provided by the local provider. The market-based EF **may** be used as the most granular and preferred location-based EF. In the absence of such a locally-specific EF, a higher-level (national) location-based EF **may** be used. In either case, the choice of EF **shall** be disclosed. Importantly, as with GHG accounting resulting from electricity use, financial institutions **must not** aggregate emissions data collected via different methods (location-based and market-based).
- **Location-based emission factors**: They **shall** account for upstream and downstream losses as well as trade effects of energy exports and imports between countries. Financial institutions **shall** refer to the final energy consumed.
- **Market-based emission factors**: Where possible, emissions **should** be calculated using time-resolved emissions factors.
- **Estimation of incomplete data**: For the purposes of accounting for financed emissions, financial institutions **shall** report GHG emissions based on actual energy consumption. When energy consumption data is not available for the entire portfolio, the remainder **should** be estimated. If estimation of energy consumption is needed, financial institutions **must** track and disclose how much energy data, and subsequently how much GHG data, was estimated, as well as the estimation methods applied for the calculation. If estimates are not included in the calculation of GHG emissions and the energy consumption data is incomplete, the actual data coverage **must** be disclosed. FIs that rely on estimated data **should** include a strategy to collect real data and replace estimated data with real data in the coming years.
- **Normalization of energy consumption based on climatic conditions**: Weather normalization **may** be used to improve like-for-like comparisons and decisions regarding the necessary decarbonization efforts of individual buildings. However, for financed emissions reporting, weather normalization **shall** not be applied.
- **Normalization for vacant space**: In order to enhance comparability for target setting, risk management, normalization for the vacant space based on “average annual vacancies” **may** be applied. Nevertheless, normalization **shall** not be done for reporting purposes, which **must** reflect the actual performance, irrespective of vacant space.

- **Fugitive emissions**: Financial institutions **shall** include fugitive emissions in their GHG emissions calculation and tracking. Official emission factors **must** be applied to convert the gathered amounts of refrigerant losses to GHG emissions. Additionally, if FIs track and disclose fugitive emissions, they **must** disclose the methodology used to calculate fugitive emissions, included any assumptions or estimations as appropriate. If FIs do not track and disclose fugitive emissions, they **must** disclose why they did not do so, their plans assess the materiality of fugitive emissions in their real estate portfolios, and their plans to collect and disclose this information in the future.
- **Gross electricity and net-energy demand**: For accurate Scope 2 GHG accounting, companies **shall** use the gross electricity purchases from the grid, including self-generated energy and total electricity purchased. If companies cannot distinguish between gross and net grid purchases, this **should** be stated and justified in the inventory. For carbon-risk-management where the actual imports and exports are not measured individually and cannot be disaggregated, the net-energy demand approach **may** be applied, although it **must** be stated clearly that the net energy demand is used in lieu of gross electricity.
- **Quality assurance and verification**: To ensure a high reliability and validity of the carbon intensity of properties, the entire carbon accounting process, methodology, and underlying input data **should** be audited and verified. In case of a lack in data availability, financial institutions **should** use the most recent data available, with the intention of aligning as much as possible.
- **Floor space measurement**: Financial institutions **shall** disclose the method by which they aggregate emissions based on various data reported to them. For absolute emissions, it is simply a matter of addition and attribution. For the calculation of intensities, which require a consistent floor area definition as a denominator, the floor area definition used **should** be used as consistently as possible throughout their GHG accounting. Financial institutions **should** use the International Property Measurement Standard (IPMS), specifically IPMS 2: Office or Residential to determine the asset floor area. For any reporting and accounting using floor area descriptions, their use and divergence from IPMS 2 **must** be explained.
- **Target setting**: Financial institutions **should** set decarbonization targets to compare their resulting carbon intensities against science-based pathways. In the projection of future building performance to comply with science-based targets, financial institutions **may** also incorporate foreseeable trends in grid decarbonization.

Acronyms

ANZ	Advancing Net Zero
BEIS	Department for Business, Energy & Industrial Strategy
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
CC0	Creative Commons Zero
CDD	Cooling Degree Days
CDP	Carbon Disclosure Project
CDSB	Climate Disclosure Standards Board
CHP	Combined heat and power
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent. The unit is used to reflect the Global Warming Potential (GWP) of Greenhouse Gases (GHG) in a manner comparable to the GWP of CO_2.
COP	Conference of the Parties of the UNFCCC
CH_4	Methane
CRREM	Carbon Risk Real Estate Monitor
CSR	Corporate social responsibility
DNSH	Do Not Significantly Harm
EASME	Executive Agency for Small and Medium-sized Enterprises
EC	European Commission
EEA	European Environment Agency
EF	Emission factor
EPBD	Energy Performance of Buildings Directive
EMAS	Eco-Management and Audit Scheme
EN	European Norm
EPRA	European Public Real Estate Association
ESG	Environmental, Social and Governance
EU	European Union
FSB	Financial Stability Board
GAAP	Generally accepted accounting principles
GBC	Green Building Council
GEA	Gross External Area
GFA	Gross Floor Area
GHG	Greenhouse gas
GIA	Gross Internal Area
GRI	Global Reporting Initiative
GWP	Global Warming Potential. GWP is used to measure the extent to which a certain Green House Gas (GHG) contributes to the heating of Earth's atmosphere in comparison with CO_2.
HDD	Heating Degree Days
HFCs	Hydrofluorocarbons
HQE	Haute Qualité Environnementale / High Quality Environment
HVAC	Heating, Ventilation and Air Conditioning
IFRS	International Financial Reporting Standards
IIGCC	Institutional Investors Group on Climate Change
IIÖ/IIO	Institut für Immobilienökonomie / Institute for Real Estate Economics

IIRC	International Integrated Reporting Council
ILO	International Labour Organisation
INREV	Investors in Non-Listed Real Estate Vehicles
IPMS	International Property Measurement Standards
IPCC	Intergovernmental Panel on Climate Change
IR	Integrated Reporting
ISO	International Organisation for Standardization
JVs	Joint Ventures
kWh	Kilowatt hour
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
LPs	Limited Partners
MSCI	Morgan Stanley Capital International
NDCs	Nationally Determined Contributions
NFRD	Non-financial reporting directive
NF_3	Nitrogen trifluoride
NGO	Non-governmental organization
NIA	Net Internal Area
NLA	Net Lettable Area
N_2O	Nitrous oxide
NZAOA	Net-Zero Asset Owner Alliance
NZCBC	Net-Zero Carbon Buildings Commitment
OECD	Organisation for Economic Co-operation and Development
PCAF	Partnership for Carbon Accounting Financials
PFCs	Perfluorocarbons
REITs	Real estate investment funds
RICS	Royal Institute of Chartered Surveyors
SASB	Sustainability Accounting Standards Board
SBPR	sustainability Best Practice Recommendations
SBTi	The Science-based Targets Initiative
SF_6	Sulphur hexafluoride
TCFD	Task Force on Climate-related Financial Disclosures
T&D	Transmission and distribution
TEG	Technical expert group
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention on Climate Change
UNPRI	United Nations Principles for Responsible Investment
USD	United States Dollar
WGBC	World Green Building Council
WRI	World Resources Institute

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Appendices

Appendix I: Task Force on Climate-related Financial Disclosures (TCFD)

Launched in 2015 by the Financial Stability Board (FSB), the TCFD is an international initiative promoted by the G20 with the mandate to develop a framework for the clear, consistent, and relevant disclosure of climate-related information by companies. It encourages organizations to report the climate-related indicators and metrics that are likely to have a material impact on the organization. Therefore, TCFD recommendations can be considered as the bridge that links corporate financial reporting with climate-related reporting. These recommendations have become the de facto standard to which most ESG reporting initiatives are aligning their climate-related requirements.

The Final Report of the TCFD is structured around four Core Elements:

- Governance: The company's governance around climate-related risks and opportunities
- Strategy: The actual and potential impacts of climate-related risks and opportunities on the company's businesses, strategy, and financial planning
- Risk Management: The processes used to identify, assess, and manage climate-related risks
- Metrics and Targets: The metrics and targets used to assess and manage relevant climate-related risks and opportunities

Appendix II: GHG Protocol

The GHG Protocol is governed by the principles of relevance, completeness, consistency, transparency and accuracy, and all the reporting and accounting developed under these standards need to be based on these principles. Reporting organizations firstly need to set up their business goals (participating in voluntary or mandatory GHG reduction programs, or GHG markets) and set up their organizational and operational boundaries according to these goals.

The next step is to select a base year and calculate that year's carbon emissions (inventory). These emissions need to be tracked and reduced after the baseline year, and the organization also needs to define the conditions that will require recalculation of the inventory if substantial changes happen in the organization structure, methodology and emission boundaries. To calculate the emissions, the organization needs to identify the sources of carbon emissions, select a calculation approach, collect the data and report the inventory at corporate level. This calculation process needs to define and implement an inventory quality management system that controls calculations as well as data, documentation and evidence gathering.

The GHG Protocol's Corporate Standard defines three different categories (so-called 'Scopes') of carbon emissions depending on the level of control an organization has in respect of each Scope (direct or indirect emissions) and their capacity to reduce them. Companies need to account for and report emissions from each Scope separately.' (See Section Direct and Indirect Emissions) provides contextualization of the Scopes and the activities that generate direct and indirect emissions.

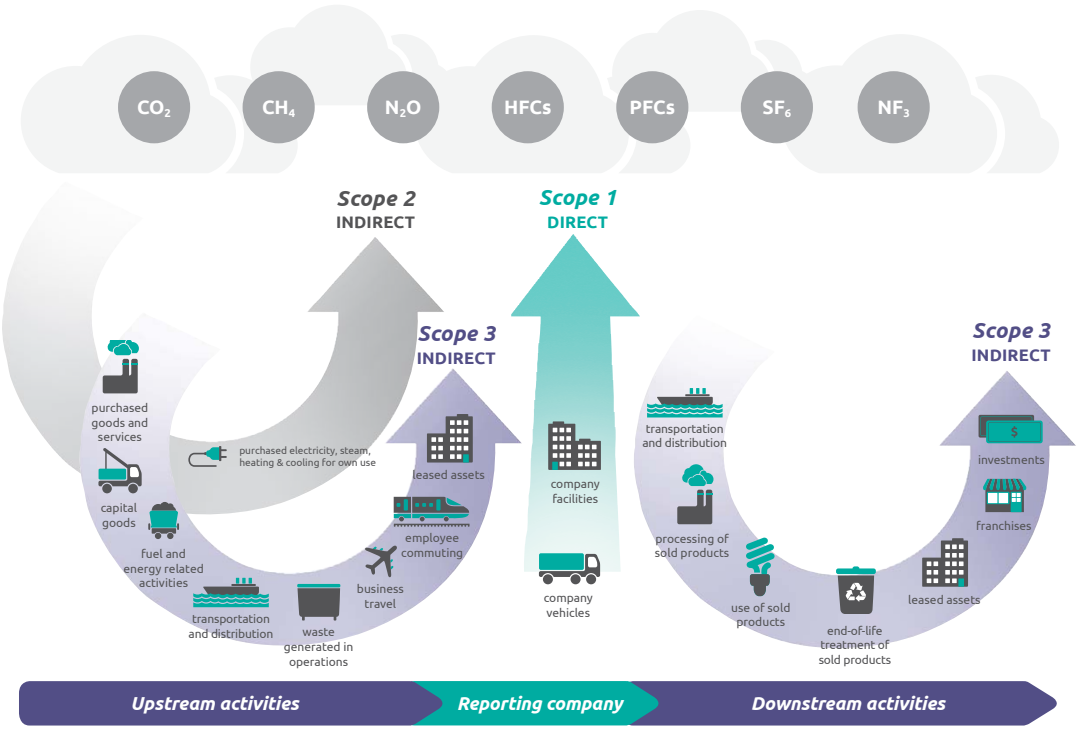
According to the GHG Protocol, the boundary of each Scope is:

SCOPE 1 EMISSIONS: Emissions from sources the organization owns or controls. These are direct GHG emissions and they are released by (1) generation of electricity, heat or steam on site, (2) chemical processing, (3) transportation of materials, products, waste and employees in company owned vehicles, and (4) fugitive emissions from intentional or unintentional releases.

SCOPE 2 EMISSIONS: Indirect emissions from the generation of purchased electricity, steam, heat or cooling generated by others, which is consumed in the organization's owned or controlled equipment or operations. The amount of electricity consumed can be controlled by the company, but the carbon emitted in the generation of the electricity as well as the losses through transmission and distribution are outside the control of the organization. Note: These emissions (Scope 2 for the company consuming electricity) are accounted as direct Scope 1 emissions in the carbon reporting of electricity providers.

SCOPE 3 EMISSIONS: Indirect emissions from any other downstream or upstream activity. Accounting and reporting Scope 3 emissions is optional according to the Corporate Standard.

FIGURE 4-1: OVERVIEW OF SCOPES AND EMISSIONS ACROSS A VALUE CHAIN



SOURCE: GHG PROTOCOL, 2013, P. 6.

Appendix III: GHG Protocol Consolidation Approaches

In the GHG accounting, defining the organizational boundary is a key step. This step determines which operations are included in the company's organizational boundary and how emissions from each operation are consolidated by the reporting company. As detailed in the GHG Protocol Corporate Standard, a company has three options for defining its organizational boundaries as shown in table 4-1.

TABLE 4-1: OVERVIEW OF GHG PROTOCOL CONSOLIDATION APPROACHES

Consolidation approach	Description
Equity share	Under the equity share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation. The equity share reflects economic interest, which is the extent of rights a company has to the risks and rewards flowing from an operation.
Financial control	Under the financial control approach, a company accounts for 100 percent of the GHG emissions over which it has financial control. It does not account for GHG emissions from operations in which it owns an interest but does not have financial control.
Operational control	Under the operational control approach, a company accounts for 100 percent of the GHG emissions over which it has operational control. It does not account for GHG emissions from operations in which it owns an interest but does not have operational control.

With financial and operational control in GHG Protocol defined as:

- **Financial control** = the reporting entity has the ability to direct the financial and operating policies of the operation with a view to gaining economic benefits from its activities.
- **Operational control** = the reporting entity or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation

According to GHG Protocol Corporate Standard, companies should use a consistent consolidation approach across the Scope 1, Scope 2, and Scope 3 inventories. The selection of a consolidation approach affects which activities in the company's value chain are categorized as direct emissions (i.e., Scope 1 emissions) and indirect emissions (i.e., Scope 2 and Scope 3 emissions). Operations or activities that are excluded from a company's Scope 1 and Scope 2 inventories as a result of the organizational boundary definition (e.g., leased assets, investments, and franchises) may become relevant when accounting for Scope 3 emissions.

For example, if a company selects the operational control approach, emissions from any asset the company controls are included in its direct emissions (i.e., Scope 1), but emissions from any asset the company wholly or partially owns but does not control (e.g., investments) are excluded from its direct emissions and should be included in its Scope 3 inventory.

Appendix IV: Scope 2 Quality Criteria of GHG Protocol Scope 2 Guidance

All contractual instruments must meet the following eight Scope 2 Quality Criteria in order to be a reliable data source for the Scope 2 market-based method.

All contractual instruments used in the market-based method for Scope 2 accounting shall:

1. Convey the direct GHG emission rate attribute associated with the unit of electricity produced.

2. Be the only instruments that carry the GHG emission rate attribute claim associated with that quantity of electricity generation.

3. Be tracked and redeemed, retired, or canceled by or on behalf of the reporting entity.

4. Be issued and redeemed as close as possible to the period of energy consumption to which the instrument is applied.

5. Be sourced from the same market in which the reporting entity's electricity-consuming operations are located and to which the instrument is applied.

In addition, utility-specific emission factors shall:

6. Be calculated based on delivered electricity, incorporating certificates sourced and retired on behalf of its customers. Electricity from renewable facilities for which the attributes have been sold off (via contracts or certificates) **shall** be characterized as having the GHG attributes of the residual mix in the utility or supplier-specific emission factor.

In addition, companies purchasing electricity directly from generators or consuming on-site generation shall:

7. Ensure all contractual instruments conveying emissions claims be transferred to the reporting entity only. No other instruments that convey this claim to another end user **shall** be issued for the contracted electricity. The electricity from the facility **shall** not carry the GHG emission rate claim for use by a utility, for example, for the purpose of delivery and use claims.

Finally, to use any contractual instrument in the market-based method requires that:

8. An adjusted, residual mix characterizing the GHG intensity of unclaimed or publicly shared electricity **shall** be made available for consumer Scope 2 calculations, or its absence **shall** be disclosed by the reporting entity.

Appendix V: Regulated and unregulated emissions (EU focus)

Depending on their level of control by building regulations, operational carbon emissions are normally divided into:

- Regulated carbon emissions are the emissions accounted and controlled by EU member states' building regulations, compliant with the minimum Scopes set by the EPBD in its Annex I . Building regulations control the thermal characteristics of the fabric; HVAC and hot water installations, built-in lighting, the impact of building design and orientation, and the production of renewable energy. Therefore, all energy consumption that is affected by these components is regulated by EPBD and national building regulations. These are the only carbon emissions included in the Energy Performance Certificates (EPC), whose calculation methodology framework is also outlined by the EPBD.
- Unregulated carbon emissions are all other operational carbon emissions released by energy consumption within a building, which are not controlled by the EPBD and subsequent building regulations. These emissions are not accounted in EPCs. They usually encompass equipment and lighting and emissions from cooking/catering. The amount and source of unregulated carbon emissions can greatly vary depending on the building use, occupant behaviour, and culture. In office buildings, these usually include IT equipment, small appliances and lighting, in hospitals they entail large medical equipment, and in the industrial sector they may include the energy consumption of various manufacturing processes.

EN 15978's definition of operational carbon is 'emissions from energy used by building-integrated technical systems during the operation of the building'. This definition was developed to 'comply with the EPBD (2002/91/EC, 2010/31/EC) and its national implementations'. However, EN 15978 also acknowledges unregulated carbon emissions, which can be accounted within B6 stage (see figure 2-2, section Operational vs. embodied carbon), but need to be reported and communicated separately.

Following the EPBD, all EU member states have developed methodologies to calculate regulated carbon emissions from buildings and report them in official EPCs. However, the carbon budgets and targets set for the real estate sector aim to reduce emissions released by all energy consumption within commercial buildings, regulated or not.

Unregulated energy consumption largely depends on the fit-out and use of the building rather than on the building characteristics or location. Benchmarks based on actual energy consumption of buildings for each typology can be used to complement regulated carbon emissions data. These unregulated energy consumption profiles are considered comparable in all EU countries for the same sector and subsector.

Participate in the public consultation and fill in the survey on https://form.typeform.com/to/cZfk14O9

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