

The challenges of ESG/CSRD reporting for insurers – A comparative analysis of carbon emission calculation methods

Az ESG/CSRD jelentések kihívásai a biztosítók számára – A szén-dioxid-kibocsátás számítási módszereinek összehasonlító elemzése

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Abstract

This paper examines the evolving landscape of sustainability reporting obligations for insurers within the European Union, focusing on the implications of the European Union's Corporate Sustainability Reporting Directive (CSRD) and its associated standards. It highlights the expanded scope and enhanced stringency of the new regulatory framework, emphasizing the requirement for comprehensive disclosure of environmental, social, and governance (ESG) data, particularly greenhouse gas (GHG) emissions. The analysis underscores the technical and methodological challenges insurers encounter in implementing GHG calculation models, including data collection, estimation accuracy, and methodological harmonization across various standards such as PCAF, NZIA, SBTi, and ISO 14097. Additionally, the paper discusses the integration of these frameworks into insurers' strategic and operational processes, the risk of greenwashing and social washing, and the importance of external assurance to ensure credibility. It emphasizes that a cohesive ecosystem of standards and frameworks is essential for developing credible climate strategies and achieving compliance, while also recognizing the significant burden and complexity posed by these evolving reporting obligations. Ultimately, the paper advocates for a collaborative multi-stakeholder approach to facilitate the transition towards transparent, consistent, and reliable sustainability disclosures in the insurance sector.

Keywords: insurance, CSRD, reporting, GHG emission

JEL codes: G22; M14; Q56; K32; G38

Absztrakt

E tanulmányban az Európai Unióban működő biztosítók fenntarthatósági jelentéstételi kötelezettségeinek aktuális helyzetét vizsgálom, különös figyelemmel az Európai Unió vállalati fenntarthatósági jelentéstételi irányelvének (CSRD) és a kapcsolódó szabványoknak történő megfelelésre. Számottevő kihívást jelent az új szabályozási keretrendszer széles hatóköre és szigorúsága, a környezeti, társadalmi és irányítási (ESG) adatok, ezen belül is különösen az üvegházhatású gázok (ÜHG) kibocsátásának átfogó közzétételére vonatkozó követelményeknek való megfelelés. Az elemzésben kiemelem azokat a technikai és módszertani kihívásokat, amelyekkel a biztosítók az ÜHG-számítási modellek bevezetése során szembesülnek, beleértve az adatgyűjtést, a becslések pontosságát és a módszertani harmonizációt a különböző szabványok, például a PCAF, az NZIA, az SBTi és az ISO 14097 között. Ezenkívül a cikkben kitérek az ESG keretrendszerek biztosítói stratégiai és működési folyamatokba történő integrálásának egyes kérdéseire, így pl. a „zöldrefestés” kockázatára, valamint arra, hogy a hitelesség megteremtéséhez megfelelő auditra is szükség van. A tanulmányban bemutatom, hogy a szabványok, keretrendszerek koherens ökoszisztémája elengedhetetlen a hiteles klímastratégiák kidolgozásához és az elvárt megfelelés eléréséhez, miként azt is, hogy a jelentéstételi kötelezettségek összetett feladatot képeznek, és számottevő többlet terhet jelentenek a korábbiakhoz képest. Az átlátható, következetes és megbízható fenntarthatósági jelentések közzétételének megvalósításához az érdekeltek szoros együttműködésére van szükség a biztosítási szektorban is.

Kulcsszavak: biztosítás, CSRD, jelentés, ÜHG-kibocsátás

JEL-kódok G22; M14; Q56; K32; G38

1. Introduction

The European Parliament adopted the Corporate Sustainability Reporting Directive (CSRD) in 2022, which came into effect in 2024 and will be applicable for reporting first time in 2025. The CSRD replaces and greatly improves the reporting obligations previously provided by the Non-Financial Reporting Directive (NFRD). The CSRD aims to provide stakeholders with clearer, more comprehensive, and standardized sustainability data, ensuring that insurers are held accountable for their role in promoting sustainability within the broader financial ecosystem.

In addition, the global energy sector itself is undergoing a significant transformation, driven by decarbonization, decentralization, and the adoption of digital technologies. (Dunay, Szuda, & Illés, 2025) The rise in global temperatures is mainly due to increased greenhouse gas emissions. Insurance companies are also directly affected by the consequences of extreme weather events. (Bringye, Eke, & Pataki, 2022)

The aim of this paper is to provide an overview of the reports to be published by insurers under the CSRD and the challenges associated with it, highlighting the scope of GHG emission calculation methods as a specific and good example of the multifaceted challenges that insurers face. The core activity of insurers is 'risk business' which permeates practically all areas of life and is known in insurance terminology as 'underwriting' (Illés & Megyeri, 2010). Given that insurance is a prerequisite for financing many activities (e.g. maritime and other shipping, industrial activities, motor mobility), insurers play a significant role in managing the transition. Accordingly, insurers must report GHG emissions on their

- own operations

- asset management portfolio (if they do) and
- due to the core operational profile, on their underwriting activities (corporate, household, motor, etc.).

2. Literature review

Given the relatively new and diverse legislative background, I begin with a focused presentation of this topic. I will then move on to review relevant parts of the emerging academic literature.

2.1. Legal background

Insurance companies operating within the European Union are subject to a comprehensive and evolving set of sustainability reporting obligations. These regulations aim to enhance transparency for investors and other stakeholders regarding the sustainability performance of companies and to channel capital towards sustainable investments. The key pillars of this reporting framework are

- the Corporate Sustainability Reporting Directive (CSRD, EU Directive 2022/2464) amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting,
- the European Sustainability Reporting Standards (ESRS) developed by the European Financial Reporting Advisory Group (EFRAG), especially ESRS E4 – Financial Services Sector, ESRS E1 and ESRS G1 – Climate risk disclosures,
- and the EU Taxonomy Regulation (EU Regulation 2020/852).

The CSRD significantly expands the scope and depth of sustainability reporting for companies in the EU, including insurance companies. (Heinisch, 2024) It amends previous legislation to introduce more detailed reporting requirements and to bring more companies under its purview. (News & Jusful, 2024)

Under the CSRD regime insurance companies are required to disclose a wide range of sustainability-related information and data, such as environmental information (greenhouse gas – GHG – emissions, climate-related risks and opportunities, environmental impact of investments, sustainable products and services), social information (social impact of products and services, diversity, equity and inclusion, community involvement), governance information (corporate governance, risk management, executive compensation), sustainability risks and opportunities information (climate-related financial disclosures, transition to a low-carbon economy), insurance sector specific disclosures (underwriting and investment activities, insurance coverage for climate-related risks), sustainability governance and strategy, EU taxonomy alignment information.

Insurers first have to define and create the required databases that enable these reports to be prepared.

The key reporting obligations under CSRD are as follows

- The CSRD applies to all large companies, listed small and medium-sized enterprises (SMEs), and certain non-EU companies with significant activity in the EU. Large insurance undertakings are explicitly included. (DLA Piper, 2024), (Boston Consulting Group, 2023)
- A core concept of the CSRD is "double materiality". This requires insurance companies to report not only on how sustainability issues create financial risks and opportunities for their business (financial materiality) but also on their own impacts on people and the environment (impact materiality). (DLA Piper, 2024)

- The CSRD mandates that companies must report sustainability information in accordance with the European Sustainability Reporting Standards (ESRS) developed by EFRAG. (Heinisch, 2024)
- The sustainability information must be published in a dedicated section of the company's management report and must be subject to external assurance, initially at a limited level. (News & Jusful, 2024)
- Reported sustainability information will need to be digitally tagged, which is expected to be a significant undertaking for companies. (Insurance Europe, 2025)

The ESRS provide the detailed framework for reporting under the CSRD and are designed to ensure the quality, consistency, and comparability of sustainability information. The standards are divided into cross-cutting standards and topical standards covering environmental, social, and governance matters. It is important to note that while sector-specific standards are planned, the specific standard for the financial services sector is not yet finalized. The current ESRS framework includes standards that are broadly applicable to all sectors, including insurance.

The ESRS E1 (Climate Change) is of high relevance for most companies, and it is expected that most reporting entities will find climate change to be a material topic. (Sustainability Economics, 2024) ESRS E1 requires detailed disclosures on how an insurance company is addressing climate change.

Key Disclosure Requirements under ESRS E1:

- Companies must disclose a transition plan that outlines how their strategy and business model are aligned with the goal of limiting global warming to 1.5°C, in line with the Paris Agreement. (Charluet, 2025) This includes past, present, and future mitigation efforts. (ClimatePartner, 2024)
- Disclosure of policies related to climate change mitigation and adaptation, the actions taken, and the resources allocated.
- Companies must report on their climate-related targets, including greenhouse gas (GHG) emission reduction targets for at least 2030 and, if available, for 2050. (Charluet, 2025)
- Reporting on total energy consumption, energy efficiency improvements, and the share of renewable energy. (ClimatePartner, 2024)
- Disclosure of gross Scope 1, Scope 2, and, where material, Scope 3 GHG emissions, following the methodology of the GHG Protocol. (Charluet, 2025)
- Information on GHG removals from own operations and the value chain, as well as the financing of GHG emission reduction projects through carbon credits. (Sustainability Economics, 2024)
- Disclosure of any internal carbon pricing schemes used and how they inform decision-making. (Schmidt, Farbstein, & Seidel, 2024)
- Companies must report on the anticipated financial effects of material climate-related physical and transition risks and opportunities. (ClimatePartner, 2024)

The ESRS G1 (Business Conduct) standard focuses on a company's strategy, processes, and performance related to business conduct. For insurance companies, this involves demonstrating a culture of ethical behavior and integrity in all their operations. (Taylor, 2024)

Key Disclosure Requirements under ESRS G1:

- Disclosure of policies on business conduct and the approach to fostering a corporate culture of integrity. This includes mechanisms for identifying and addressing unlawful behavior. (Akkermans, 2025)
- Information on how the company manages its relationships with suppliers, including procurement processes and ensuring fair treatment. (Akkermans, 2025)
- Details on systems in place to prevent and detect corruption and bribery, including whistleblower protection. (Shaw, 2024)
- Reporting on any confirmed incidents of corruption or bribery, including convictions and fines. (Akkermans, 2025)
- Transparency regarding political influence and lobbying activities. (Shaw, 2024)
- Disclosure of payment practices, especially concerning late payments to small and medium-sized enterprises (SMEs). (Akkermans, 2025)

The ESRS E4 (Biodiversity and Ecosystems) standard requires companies to report on their impacts, dependencies, risks, and opportunities related to biodiversity and ecosystems. (Csr-tools, 2024) This is particularly relevant for an insurer's investment portfolio, which may include companies with significant impacts on the natural world.

Key Disclosure Requirements under ESRS E4:

- Description of the process to identify and assess actual and potential impacts on biodiversity and ecosystems within their own operations and across the value chain.
- Disclosure of policies to manage and remediate material biodiversity-related impacts, dependencies, risks, and opportunities, and their alignment with frameworks like the EU Biodiversity Strategy for 2030.
- Description of key actions taken and planned to achieve biodiversity-related policy objectives and targets, and the resources allocated.
- Disclosure of the biodiversity and ecosystem-related targets the company has adopted. (EFRAG, 2022)

The EU Taxonomy Regulation (EU Regulation 2020/852) is a classification system that establishes a list of environmentally sustainable economic activities. It aims to provide a common language for investors and companies to identify which economic activities can be considered sustainable, thereby helping to channel investment towards a green transition. (DLA Piper, 2024)

Key Reporting Obligations under the EU Taxonomy:

- An economic activity is considered environmentally sustainable if it contributes substantially to one or more of the following six environmental objectives, does not significantly harm any of the others, and meets minimum social safeguards:
 - o Climate change mitigation
 - o Climate change adaptation

- The sustainable use and protection of water and marine resources
 - The transition to a circular economy
 - Pollution prevention and control
 - The protection and restoration of biodiversity and ecosystems (DLA Piper, 2024)
- Companies must first identify which of their economic activities are "taxonomy-eligible" (i.e., described in the Taxonomy's delegated acts). They must then assess whether these activities are "taxonomy-aligned" by meeting the technical screening criteria for substantial contribution and do-no-significant-harm. (Autorité des Marchés Financiers, 2022)
- Insurance companies, as financial undertakings, must disclose the proportion of their investments that are in taxonomy-aligned economic activities. For their non-financial assets, they report on the proportion of their turnover, capital expenditure (CapEx), and operating expenditure (OpEx) that is associated with taxonomy-aligned activities.
- Specifics for Insurance Underwriting:
- Since insurance companies have a significant role in financing high-carbon activities, they will need to disclose how their underwriting and investment practices align with climate goals, including any specific exclusion policies (e.g., no coverage for coal projects or fossil fuel companies).
 - Insurers will need to disclose the types of coverage they provide in relation to climate risks (e.g., flood or wildfire insurance) and how these may evolve in the context of climate change. For non-life insurance and reinsurance activities, the regulation outlines criteria for these activities to be considered as contributing to climate change adaptation. This includes, for example, the provision of insurance coverage for climate-related hazards and the sharing of claims data with authorities to improve climate adaptation models. (Helvetia, 2023)

2.2. Systematic literature review

Although the academic literature on the ESG obligations of insurers is currently quite limited, a substantive and interesting dialogue on this issue has begun within the academic community.

Vercher-Moll diagnoses that the Principles for Sustainable Insurance (PSI) represent a significant paradigm shift, establishing a cross-cutting framework that redefines the traditional insurance business model. The PSI seek to improve insurer behavior by imposing a long-term culture focused on protecting stakeholders and enhancing corporate reputation. While not legally binding, they can be effectively combined with the Principles for Responsible Investment (PRI) for managing investments, but it is paramount that the pursuit of ESG objectives does not undermine the fundamental requirement of maintaining robust solvency ratios. The principles should be applied proportionally to different types and sizes of insurers. Finally, independent assurance is considered vital to validate the implementation of PSI, although the process of the insurer appointing the assurer may raise potential conflicts of interest. (Vercher-Moll, 2025)

Bataller-Grau concludes that transparency for insurance entities is no longer a voluntary choice but a legally mandated duty under frameworks like the Corporate Sustainability Reporting Directive (CSRD). The credibility and effectiveness of this reporting depend on its ability to provide a "true and fair picture," which necessitates the intervention of an independent assurer to verify the information. A key

principle is that values in sustainability reporting are not fungible; for example, positive environmental actions cannot offset negative social impacts. This is enshrined in the "do no significant harm" (DNSH) principle, which is crucial for the integrity of the reporting. (Bataller-Grau, 2025)

According to Kawiński's analysis while Central and Eastern European (CEE) insurance markets are less developed than their Western European counterparts, the Solvency II regulatory framework is workable, even if it is perceived as costly or overstated for these markets. The framework is seen as a force for positive change, shaping the future development of these markets. Regarding ESG integration, CEE markets are underdeveloped, with low local demand for ESG products, particularly from retail clients. However, there is a clear interest in governance issues, driven by new reporting regulations. Experts predict that while the readiness to offer ESG products is currently low, it is expected to increase. The article highlights that climate, cyber, and longevity risks are and will remain significant challenges for the region. (Kawiński, 2025)

Llorca Galiana interestingly connects the topic of ESG with product governance. European Union's regulatory push, particularly the Taxonomy and SFDR Regulations, has initiated a structural shift in the financial system toward sustainable activities. Product governance is identified as a crucial tool for this transformation, providing security to investors through a rigorous process of product design, development, and distribution that explicitly incorporates sustainability factors. While the current array of investment options that strictly comply with these new regulations is still limited, the author notes that this is an initial phase, and the regulatory framework will inevitably lead to a broader and more transparent market for sustainable financial products. (Galiana, 2025)

Marianna Cicirko concludes that there are significant differences in financial market development between CEE and non-CEE countries, making the demanding Solvency II framework a costly, but workable, regulatory environment for the CEE region. ESG topics are underdeveloped in CEE, with low interest from Polish firms and authorities, except for governance, which is driven by reporting regulations. While the supply of ESG products is currently low, it is expected to increase. The author highlights that climate, cyber, and longevity risks pose significant challenges for insurers in the region now and in the foreseeable future. (Cicirko, 2025)

Marano and del Val Bolívar Oñoro find that a major challenge for the effectiveness of ESG ratings is the lack of a unified, prescriptive social taxonomy within the EU legal framework. This ambiguity creates a substantial risk of "social washing," where misleading information is used to present a company's social practices as more sustainable than they are. An empirical analysis of six prominent rating agencies confirms that their methodologies for assessing the "social" component of ESG are not unified, making it difficult for stakeholders to compare results and increasing the risk of biased, "a la carte" ratings. The authors argue that a harmonized social taxonomy is necessary to limit opinion-based ratings and mitigate these risks. (Marano & del Val Bolívar Oñoro, 2025)

Isabel Rodríguez Martínez concludes that insurers marketing Insurance-Based Investment Products (IBIPs) are now operating under a complex and detailed legal framework of transparency obligations, primarily driven by the SFDR and Taxonomy Regulation. The main purpose of this new framework is to provide policyholders with mandatory and comprehensive sustainability information on how insurers integrate ESG criteria into their governance and how the social and environmental impacts of their products are managed. This is intended to empower investors to make informed, rigorous, and consistent choices, thereby influencing capital allocation toward sustainable objectives. (Martínez, 2025)

According to Mateos-Ronco the viability of farming is critical for sustainable food systems, and public policies like the Common Agricultural Policy (CAP) play a vital role in supporting risk management.

The author notes that while traditional insurance products exist, new insurance lines are needed to address evolving risks from climate change and market volatility, but their development is hindered by factors like high premiums, high loss thresholds, and a lack of reliable on-farm data. The Spanish agricultural insurance system is presented as a strong model, but even this system faces challenges in implementing new products like income or revenue insurance due to regulatory and technical constraints. The article calls for future strategies to focus on improving transparency, coordination, and research into new coverage types. (Mateos-Ronco, 2025)

Petelczyc examines the issue of pensions in the light of climate risks. She emphasizes, that climate-related pension risk is a combination of financial and climate risks that could severely impact the quality of life for future pensioners. Despite a high level of interest in sustainable investments among Polish Employee Capital Plan (PPK) participants, a majority are unwilling to sacrifice financial returns for these goals. A critical finding is that PPK participants have virtually no influence on the investment policies of their funds, as the law does not consider them stakeholders in this regard and even mandates investments in a low-ESG-ranking index. The author suggests that the EU's SFDR may be insufficient in this context, as its reliance on reputational risk is ineffective in a system where participants have minimal influence. (Petelczyc, 2025)

Kosi and Relard examine whether the announcement and passing of the CSRD impacts the sustainability reporting of German firms. Their paper concludes that the announcement and passing of the CSRD have led to increased sustainability reporting practices among firms already subject to the NFRD, as they begin to implement the new reporting requirements in advance of the regulation's first official reports in 2025. However, it finds no evidence that firms outside the current scope of NFRD are voluntarily increasing their sustainability disclosures in preparation for CSRD. Additionally, the study emphasizes that preparing for the extensive and more stringent reporting under CSRD can be a substantial burden for firms, particularly those lacking prior experience with sustainability reporting. It highlights the importance of a collaborative approach involving firms, policymakers, and assurance providers to facilitate the transition towards more comprehensive and consistent sustainability disclosures, which are essential for fostering sustainable development and accountability across sectors. (Kosi & Relard, 2024)

3. Methodology

As one of the most basic reporting requirements, insurers must publish their reports on the GHG emissions of their own operations, asset management portfolio (if any) and on core operations i.e. the underwriting activities (corporate, household, motor, etc.).

After reviewing the legal background and scientific literature, I collected the publicly available GHG methodologies or frameworks that could potentially serve as the basis for calculations for insurers, systematically analyzed them, explored the differences and similarities among them, and then presented them in a comparative manner.

For calculating GHG emissions – a fundamental reporting requirement – there are five principal models that are suitable for insurers:

- GHG Protocol – Corporate Value Chain (Scope 3) Standard
- ISO 14097 – Framework for Climate-related Assessments for Investments and Financing Activities
- PCAF – Partnership for Carbon Accounting Financials

- Net-Zero Insurance Alliance (NZIA) Target-Setting Protocol
- SBTi – Science Based Targets initiative (Financial Institutions Guidance)

4. Results

Below, I summarize the results of the analysis of the five GHG calculation frameworks (GHG Protocol Scope 3, ISO 14097, PCAF, NZIA, and SBTi) specifically from insurers' perspective and then compare them.

GHG Protocol – Corporate Value Chain (Scope 3) Standard

The Greenhouse Gas Protocol (GHG Protocol), a multi-stakeholder partnership convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), is the internationally accepted standard for greenhouse gas accounting and reporting. Launched in 1998, its mission is to create a standardized language and set of tools for companies to measure and manage their emissions. The GHG Protocol's five core principles are relevance, completeness, consistency, transparency, and accuracy. (World Resources Institute, Greenhouse Gas Protocol - Scope 3 - Standard Development Plan - 2024.12.20 - GHG Protocol, 2024)

The GHG Protocol classifies emissions into three "scopes." Scope 1 covers direct emissions from owned or controlled sources. Scope 2 accounts for indirect emissions from the generation of purchased electricity, steam, heating, and cooling. Scope 3 covers all other indirect emissions that occur in a company's value chain, both upstream and downstream. Released in 2011, the Corporate Value Chain (Scope 3) Standard provides the methodology for companies to assess and report on these emissions, which for most organizations (like insurance companies), represent the largest portion of their total carbon footprint. The standard defines 15 categories of Scope 3 activities, providing minimum boundaries for each to help companies identify and standardize which emissions to include in their inventory. (World Resources Institute, Corporate Value Chain (Scope 3) Standard, 2011)

ISO 14097 – Framework for Climate-related Assessments for Investments and Financing Activities

The objective of ISO 14097 is to provide a framework that harmonizes definitions and concepts related to the measurement of contributions to climate goals and exposure to climate-related risks. It is a guiding standard that supports investors' work on climate issues by defining benchmarks, identifying relevant climate actions for each type of financial activity, and providing reporting and communication requirements. (ISO STANDARD FOR INVESTMENT, FINANCING AND CLIMATE CHANGE (ISO 14097), 2017) The standard explicitly addresses the strategic role of financiers in influencing the behavior of "investees" in the real economy through their day-to-day decisions, which can include capital allocation and R&D expenditures. (ISO 14097:2021 Greenhouse Gas Management Training Course - BSI, 2021) It recommends defining a list of financial institutions' "actions" that can contribute to climate-related risk management and defining metrics to track both climate risk (e.g., forward-looking value at risk) and positive impact (e.g., tracking company indicators at a physical asset level).

In this ecosystem of standards, ISO 14097 serves as the governance umbrella. It provides the strategic blueprint for how an organization should structure its response to climate change. The framework ensures that the granular, operational data from a methodology like PCAF, and the ambitious, science-based targets from initiatives like the SBTi and NZIA, are not isolated efforts but are seamlessly integrated into a coherent, enterprise-wide strategy. By providing a measurement framework to connect

financial activities to their real-world impact and by offering guidance for reporting on mandatory programs, ISO 14097 bridges the gap between technical, operational work and top-level corporate governance and compliance. (ISO STANDARD FOR INVESTMENT, FINANCING AND CLIMATE CHANGE (ISO 14097), 2017)

PCAF – Partnership for Carbon Accounting Financials

The Partnership for Carbon Accounting Financials (PCAF) was created in 2015 by a group of Dutch financial institutions seeking to fill the methodological gap left by the GHG Protocol. It is a global, industry-led collaboration that provides a standardized framework, known as the "Global GHG Accounting and Reporting Standard for the Financial Industry". This standard has earned a "Built on GHG Protocol" mark, which signifies that its methodologies conform to and align with the GHG Protocol's foundational principles. (PCAF: Reporting Standard Beginner's Guide - Persefoni, 2024) For a financial institution, particularly an insurer, seeking to set credible net-zero targets or prepare for mandatory disclosures, PCAF is the industry-specific standard designed to cover its most critical Scope 3 business activities. (PCAF: A Practical Guide to Financed Emissions Accounting - Workiva, 2025)

For insurers, a crucial development was the launch of the "Insurance-Associated Emissions" (IAE) Standard, which was developed by the PCAF in collaboration with the Net-Zero Insurance Alliance (NZIA). (Net-Zero Insurance Alliance launched the first Target-Setting Protocol, 2024) This standard provides detailed methodological guidance for measuring and disclosing emissions from insurance underwriting portfolios, specifically covering commercial and personal motor lines of business. This new standard is a direct and necessary response to the growing recognition that insurance portfolios are a significant source of value chain emissions that were not adequately covered by existing frameworks. (Forsythe, et al., 2024)

PCAF's core methodology for IAE is based on a principle of "follow the risk," which is distinct from the "follow the money" principle used for investments and loans. The calculation involves an "attribution factor," which represents the share of an insured entity's total GHG emissions that is associated with the insurer's underwriting portfolio. For commercial portfolios, this factor is determined by the ratio of premiums to the client's revenues. For personal motor portfolios, the attribution is calculated based on the share of insurance in the total cost of ownership of a vehicle. This nuanced approach reflects the unique financial relationship between an insurer and its clients. (FAQ document - Partnership for Carbon Accounting Financials (PCAF), 2022)

PCAF requires institutions to use the highest quality data available, but it also acknowledges that this can be a significant challenge, especially for smaller entities that may not be subject to climate regulations. The importance of reliable underlying data is also emphasized by Malatyinszki, Módosné Szalai, Jenei, Kerekes and Kálmán (2024), who highlight that sustainability-related economic assessments require methodological consistency and robust indicators, particularly when environmental and economic dimensions are jointly evaluated. To address this, PCAF has introduced a pragmatic and transparent data quality scoring system, which provides a score from 1 (highest quality) to 5 (lowest quality). (PCAF: A Practical Guide to Financed Emissions Accounting - Workiva, 2025)

This system allows insurers to use estimated or proxy data where reported emissions are unavailable, while still being transparent about the reliability of their calculations. It also serves as a mechanism to demonstrate a commitment to improving data quality over time. PCAF provides a web-based emissions factor database to help insurers and reinsurers get started with estimating their portfolios' emissions, a feature that can be invaluable for forming an initial assessment and plugging data gaps.

The existence of this standardized methodology provides a direct and practical pathway for EU insurers to comply with the Scope 3 reporting requirements of the SFDR and CSRD. By using a framework that is "Built on GHG Protocol" and provides prescriptive, industry-specific calculation methods, an insurer can generate the data needed for mandatory reporting in a consistent, comparable, and defensible manner.

The Net-Zero Insurance Alliance (NZIA)

The Net-Zero Insurance Alliance (NZIA), convened by the UN Environment Programme's Principles for Sustainable Insurance Initiative (PSI), is a coalition of leading insurers committed to transitioning their underwriting and reinsurance portfolios to net-zero emissions by 2050. The alliance, which represents about 15% of the world's premium volume, was formed to enable insurers to play a catalytic role in the global climate transition through joint action and a shared framework. (PwC, 2023)

The NZIA's commitment was solidified with the launch of its first Target-Setting Protocol in January 2023. This protocol provides the actionable guidance for members to set science-based, intermediate targets for their portfolios. A critical feature of this protocol is that it is explicitly built on the global accounting standard developed by PCAF for insurance-associated emissions. This direct link between the two frameworks creates a seamless workflow, allowing an insurer to move from calculating its emissions to setting meaningful reduction targets. (Net-Zero Insurance Alliance launched the first Target-Setting Protocol, 2024)

The Protocol outlines five target types within three distinct categories, reflecting a nuanced understanding of the insurer's role in the transition. These categories move beyond simple portfolio decarbonization to a more holistic approach:

- Emissions Reduction: This category includes targets for reducing either the absolute emissions or the emissions intensity of a portfolio.
- Engagement: These targets focus on actively engaging with clients to help them decarbonize their businesses. This approach recognizes that an insurer can drive significant real-world change by supporting high-emitting sectors in their transition, rather than simply divesting from them.
- Insuring the Transition: This category involves targets for underwriting businesses and projects that are actively enabling the transition to a low-carbon economy.

The NZIA Protocol set clear deadlines for its members, requiring existing signatories to set their initial target by July 31, 2023, and at least one target type in each of the three categories by July 31, 2024. This shift from a broad commitment to a concrete implementation timeline demonstrates the alliance's intent to move beyond rhetoric and drive tangible, verifiable action. (Net-Zero Insurance Alliance launched the first Target-Setting Protocol, 2024)

Although NZIA was dissolved as of 25.04.2024, its Target-Setting Protocol still serves as a voluntary best practice guide to aid in the accurate measurement, standardisation, and comparability of science-based decarbonisation targets for insurance and reinsurance underwriting portfolios and to enhance overall transparency and accountability across the insurance industry on climate action. (UN Environment Programme Finance Initiative, 2025)

The Science Based Targets initiative (SBTi)

The Science Based Targets initiative (SBTi) is a corporate climate action organization that provides a framework for companies to set GHG emissions reduction targets that are aligned with the latest climate science. The SBTi's mission is to translate the ambition of the Paris Agreement into clear, actionable pathways for businesses to limit global warming to a maximum of 1.5°C. An insurer's climate strategy gains significant credibility and market recognition by having its targets validated by the SBTi. (The SBTi opens net-zero standard for finance industry - Science Based Targets Initiative, 2025)

The SBTi has released a Financial Institutions Net-Zero (FINZ) Standard, which provides a clear pathway for financial institutions, including banks, asset managers, and insurers, to set credible net-zero targets. This standard is fully aligned with the SBTi's flagship Corporate Net-Zero Standard and provides flexibility in how institutions can achieve their goals. For example, institutions can choose to focus their targets on either the decarbonization pathways for their financed emissions or the net-zero alignment of their customers and clients. This flexibility recognizes the unique complexities of the financial sector and empowers institutions to use their influence to support decarbonization through active engagement. (Williment, 2025)

Recognizing the unique nature of the insurance sector, the SBTi has published an "Insurance Underwriting Industry Brief" as a foundational step toward the development of a specific Financial Institutions Net-Zero Insurance Standard. The brief provides background and context on approaches for setting science-based targets for underwriting portfolios and outlines how this forthcoming standard will fit into the SBTi's existing framework. (SBTi Kickstarts Net-Zero for Insurance Underwriting with New Industry Brief, 2023) The SBTi is actively exploring the development of this standard in partnership with the NZIA, demonstrating a concerted effort to create a harmonized, credible framework for the insurance industry. (INDUSTRY BRIEF FOR THE SBTi FINANCIAL INSTITUTIONS NET-ZERO INSURANCE STANDARD (UNDERWRITING PORTFOLIOS), 2023)

The collaboration between PCAF, NZIA, and SBTi reveals a coordinated ecosystem for credibility and action. Financial institutions can use PCAF's methodologies to measure their emissions baseline, and then use this data to set targets that are validated by the SBTi against climate science. (Strategic and accredited partners - Partnership for Carbon Accounting Financials (PCAF), 2025) For the underwriting portfolio, the NZIA Target-Setting Protocol provides the specific implementation plan, which is supported by the technical standard from PCAF and is being harmonized with the SBTi's forthcoming guidance. This structured approach helps insurers navigate the market without fear of greenwashing, as their targets are grounded in science and verified by a respected third party.

The following table provides a synoptic comparison of the five frameworks.

Table 1: *Synoptic comparison table of the GHG frameworks relevant for insurers*

| Frame-work | Scope for Insurers | Output | Strengths | Weaknesses | Alignment |
|-------------------------------|--|--|---|--|---|
| GHG Protocol (Scope 3) | All corporate value chain emissions; includes a high-level "Invest-ments" category | A methodology to quantify and report Scope 3 emissions | Globally accepted foundational standard for corporate emissions accounting, harmonized methodology for a full emissions inventory. Necessary first step for a credible climate strategy. Conceptual framework for mandatory EU disclosures. User-friendly guidance. | The guidance for financial institutions is high-level and lacks the specific, granular calculation methodologies needed for the insurance sector. Not well-suited for comparing different companies. | Foundational standard for global emissions accounting |
| ISO 14097 | Investments and financing activities; a high-level standard for risk management and reporting | Guidance for setting objectives, assessing risks, identifying actions, and reporting | A high-level, principles-based standard for to strategically integrate climate considerations into business strategy and risk management. Provides guidance for reporting on both voluntary commitments and mandatory programs. | Povides broad guidance on "what" to report but lacks the detailed, technical instructions on "how". Not a prescriptive calculation tool like PCAF. | TCFD; ISO 31000 (risk management); Paris Agreement |
| PCAF | Financed emissions: seven asset classes. Insurance-associated emissions: underwriting portfolios | Granular, asset-class-specific methodologies and a data quality scoring system | Fills the methodological gap left by the GHG Protocol by providing a standardized, prescriptive framework for calculating financed and insurance-associated emissions. It is the first global standard for measuring and reporting insurance-associated emissions. The data quality scoring system is a key strength, allowing insurers to create a transparent baseline with proxy data when needed. | Data availability and quality remain a significant challenge. The standard's scope is still developing, with guidance for some lines of business, such as life, health, not yet available. Converting internal underwriting data for calculations can be a time-consuming process. | GHG Protocol; TCFD; SBTi |

| | | | | | |
|---------------------------|---|--|---|--|--|
| NZIA | Insurance and re-insurance underwriting portfolios | Five target types within three categories: emissions reduction, engagement and insuring the transition | Sector-specific framework for insurers to set science-based, intermediate targets for their underwriting portfolios in line with a 1.5°C pathway. Offers a holistic and flexible approach with five target types across three categories (emissions reduction, engagement, and insuring the transition). | The reliability of the final figures can be affected by the limited quality of the underlying emissions data. The success of the protocol is also dependent on a broader economic transition, which may not always align with the targets. | Paris Agreement; UN Principles for Sustainable Insurance; PCAF |
| SBTi (FI Guidance) | Lending, investment and insurance activities; also covers fossil fuel transition policies | Validated near-term and net-zero targets aligned with a 1.5°C pathway | Suitable for setting ambitious, independently validated targets aligned with the Paris Agreement, providing a high level of credibility and helping to mitigate greenwashing risks. Flexible, allowing institutions to focus on the net-zero alignment of their clients as a viable alternative to purely focusing on financed emissions. | The specific net-zero standard for underwriting is still under development. The SBTi's public dashboard for company targets typically does not provide temperature alignment for Scope 3 emissions, which are the most significant for insurers. | Latest climate science; Paris Agreement; GHG Protocol |

5. Discussion

The study presents possible methods for presenting GHG emissions, but the difficulty is that insurers rarely or never have direct emission data related to their insured portfolio, therefore the statistics used and substantiated estimates play a significant role. The quality of the data, the careful plugging of data gaps and the methodology used play a key role in the accuracy and credibility of the reports. This issue extends beyond technical reporting and touches the broader credibility of sustainability transition processes. Kálmán, Malatyinszki, Zugor and Szóke (2024) suggest that trust in green transition mechanisms is closely linked to transparency and governance quality, implying that inaccurate or weakly substantiated ESG disclosures may undermine broader stakeholder trust in insurers' climate strategies.

Within non-life insurance, motor line accounts for a significant portion of the insured portfolio's GHG emissions. It is also important where the focus is within the portfolio (e.g. car or truck), how much direct mileage data the company has, or if not, what kind of statistics (European, national level, or even more precise) are available. For example, in the case of telematics-based motor insurance (pay as you drive – PAYD, but especially pay how you drive – PHYD), the insurer has extremely accurate data. A potential solution for traditional motor insurance (non-PAYD or non-PHYD) involves enabling insurers to access mileage data from a central registry, where it is periodically recorded. In Hungary, for instance, insurers are exploring ways to obtain this data from the Vehicle Service Platform, a centralized database. While the legal framework for this data exchange exists, the technical infrastructure requires further development, even though similar two-way online data systems are well functioning for other purposes. Access to more precise mileage data would not only enhance the accuracy of GHG emissions reporting but also provide the foundation for creating new, taxonomy-aligned insurance products.

All these factors should be considered when developing a tailored methodology and applying the relevant GHG frameworks.

6. Conclusion

By the year 2025 insurance companies had to ensure they were fully compliant with standardized CSRD reporting requirements. Under the CSRD regime insurance companies are required to disclose a wide range of sustainability-related information and data. They must follow the ESRS standards and EU Taxonomy Regulation. These expectations present new challenges for insurers, as they must define, collect, generate or at least reliably estimate data that was previously partially or not collected at all. In addition, insurers have to find and/ or create the right methods to produce their mandatory reports in a consistent, comparable, and defensible manner.

A good example of this is finding the appropriate way for calculating GHG (Carbon) emissions, which is one of the most fundamental elements of CSRD reports. If we look at this reporting requirement, we find five main models that appear suitable for insurers. However, each has its strengths and weaknesses. It is clear that no single method is suitable to fully meet the expectations of the insurers.

The GHG Protocol establishes the global accounting standard for corporate emissions, but its guidance for financial institutions is high-level. PCAF, which is built upon the GHG Protocol's principles, provides the industry-specific, prescriptive methodologies to calculate those emissions, particularly for the complex realm of insurance underwriting. The output of PCAF is a verifiable baseline of financed

and insurance-associated emissions. This emissions baseline, measured using PCAF's methodologies, is the essential prerequisite for setting credible targets.

The NZIA and SBTi frameworks provide strategic guidance and scientific validation for those targets, enabling an insurer to move from a raw number to a committed action plan. NZIA's protocol is directly built on PCAF's standard, creating a seamless path for insurers.

The principles of ISO 14097 provide the overarching strategic guidance and governance structure. It ensures that the operational work of measurement and target-setting is not a siloed effort but is fully integrated into the firm's enterprise-wide risk management and business strategy. This top-down framework ensures that the bottom-up data and commitments are aligned with a coherent corporate vision.

A sophisticated understanding of the calculation frameworks reveals that they are not mutually exclusive alternatives but rather complementary parts of a cohesive ecosystem. Each standard or initiative serves a distinct purpose, and a comprehensive, credible climate strategy for an EU insurer requires their combined application.

Each insurance company must find, develop and tailor the reporting methods that best suit their operations and customer base. The available frameworks in their combined complexity provide an excellent basis for all this.

A collaborative multi-stakeholder approach is essential to facilitate the transition towards transparent, consistent, and reliable sustainability disclosures in the insurance sector.

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