Implications for Actuaries from the ISSB and Global Climate-related Financial Disclosure Standards

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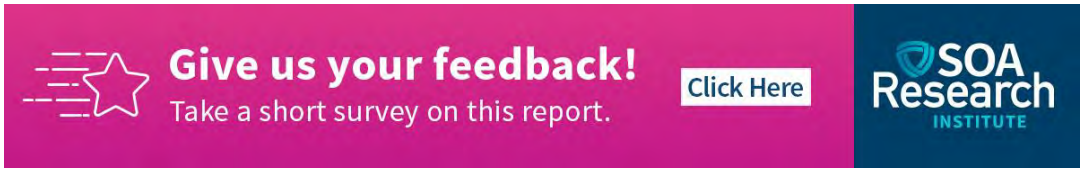
Executive Summary

This paper discusses the new International Sustainability Standards Board ("ISSB") climate and sustainability disclosure standards, focusing on the climate-related financial disclosure requirements. The goal of this paper is to extract the key insights from the ISSB and other significant climate and sustainability disclosure standards and regulations, aiming to equip actuaries with a thorough yet concise understanding of the climate disclosure landscape.

Section 1: Standards – This section provides an overview of the new ISSB disclosure standards published in June 2023, namely International Financial Reporting Standard (IFRS) S1 for General Requirements for Disclosures of Sustainability-related Financial Information, and IFRS S2 for Climate-related Disclosure. It primarily discusses the objectives, scope, requirements, and principles of the ISSB standards, as well as the industry-based disclosure requirements for insurance. This section also examines other major sustainability and climate standards, their core principles and requirements, and their similarities and differences to the ISSB standards. The section concludes with an illustrated table comparing the key dimensions across all standards. While applying ISSB standards, it is advised that users cross-reference other standards to ensure the usefulness of the sustainability information. Various sustainability standards are evolving to align with the ISSB standards. Companies adopting existing sustainability frameworks should be aware of the updates to and gaps with ISSB standards.

Section 2: Regulations – This section focuses on climate-related disclosure regulations drafted by various regulatory organizations in the U.S., Canada, and Europe, with a supplementary discussion on Asia Pacific's adoption of the new ISSB standards. Each of the regulations is analyzed and compared to the four pillars of the ISSB standards: 1) Governance, 2) Strategy, 3) Risk Management, and 4) Metrics and Targets. The takeaway from this section is an understanding of these region-specific guidelines and how regulatory bodies enforce compliance through assurance processes. Financial institutions operating in these regions should stay informed about updates to these climate risk management regulations.

Section 3: Actuarial Involvement – This section explores the potential role of actuaries in relation to the four pillars outlined in the ISSB standards. It emphasizes how actuaries can utilize their existing skills and roles to support the implementation of new sustainability standards and regulatory changes. The section identifies several areas where actuaries are well-positioned, particularly in the Risk function and in supporting insurance companies with strategy through their modeling skills and professional judgment. Additionally, it highlights emerging areas beyond traditional actuarial work, such as GHG (greenhouse gas) accounting, where actuaries can contribute to data analysis, calculation, scenario modeling, and the optimization of investment and product strategies.



Introduction

Climate change represents a serious and unique global challenge, requiring coordinated action among governments, industries, and societies to address the issue. The rapid increase in greenhouse gas emissions ("GHG") since the beginning of the industrial era is believed to be one of the driving forces behind rising global temperatures and increasing extreme weather events. At issue are several activities that are carried out globally that contribute most to GHG emissions. This includes the production of electricity, transportation, industrial activity, and agriculture, among others. According to Carbon Majors, a database tracking historical emissions of the world's largest fossil fuel and cement producers, 80% of global industrial emissions between 2016 and 2022 can be traced to just 57 entities[1].

By many measures, investments of trillions of dollars over the next few decades will be required to promote the changes necessary to keep the increase in global average temperature well below 2 degrees Celsius above pre-industrial levels, as first envisioned in the Paris Treaty. For example, the UN Environment Programme's 2023 Emissions Gap Report states that several trillion dollars (USD) of financing per year will be required to achieve decarbonization[2].

This gap can be funded through a mix of both public and private capital, and the financial sector would have a role to play in this. This includes banks, insurance companies, pension funds, and other institutional and even retail investors. But how can this be achieved? To make robust, risk-informed investment decisions, investors will require detailed information about the true impacts of climate risk on the current and future prospects of entities, industries, and sectors.

These impacts are commonly categorized into physical and transition risks. Physical risks pertain to the immediate and long-term consequences of climate change on company operations, assets, and supply chains. These include acute risks, such as damage from hurricanes, floods, and wildfires, and chronic risks, like the gradual effects of rising sea levels and increasing temperatures. For example, a manufacturing facility in a region prone to flooding might experience more frequent operational interruptions and increased costs. Transition risks are related to the societal shift towards a low-carbon economy. These involve changes in government policies, technological advancements, market trends, consumer preferences, and legal requirements designed to combat climate change. Companies may face higher expenses due to stricter environmental regulations, such as carbon taxes, and market risks as consumer demand shifts towards eco-friendly products. Understanding an entity's exposure to these risks, as well as how an entity plans to manage them, will be the key to incorporating climate-risk considerations into the investment process. The issue, then, is where to find this information for the stakeholders.

This brings us to the advent of climate disclosure standards, and the purpose of this paper. The development of climate disclosure standards has been in progress for over 25 years, beginning with the signing of the Kyoto Protocol and the introduction of GHG emissions-reduction targets. This led to rapid, albeit fragmented, development of various climate disclosure standards and approaches, including the establishment of the Global Reporting Initiative in 1997, the publication of the first GHG Protocol Standard in 2001 and, more pivotally, the release of the Financial Stability Board's Task Force on Climate-Related Financial Disclosures (TCFD) recommendations in 2017.

[1] Carbon Majors Database Launch Report 2024, page 14
[2] UNEP Emissions Gap Report 2023, page 37

With the publication of the ISSB's sustainability and climate disclosure standards, IFRS S1 and IFRS S2, a big step forward in facilitating wide-spread adoption of a single framework has been taken by providing stakeholders with comprehensive information on how climate change impacts their operations, ultimately supporting the transition to a low-carbon economy.

Focusing on the ISSB standards, Section 1 of this report will delve into the details of the most significant climate disclosure standards released to date, providing actuaries with a fundamental understanding of each standard, including the main facets and requirements of each, and how they compare with the ISSB standards. Section 2 provides an examination of several climate regulations, juxtaposing these against the ISSB disclosures. Section 3 will conclude with a look at the various ways that actuaries can become involved in the production of climate disclosure standards and regulations, as well as climate risk management more generally.

Section 1: Standards

1.1 INTRODUCTION

The ISSB is an independent standard-setting body that develops global standards for sustainability-related financial information. The ISSB operates under the auspices of the IFRS Foundation. In June 2023, the ISSB released two standards – IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information and IFRS S2 Climate-related Disclosures, which take effect for reporting periods beginning January 1, 2024. These standards are intended to set out the general and industry-specific requirements for disclosing sustainability and climate-related financial information, complementing the existing IFRS standards to provide consistent information for investors and other stakeholders. The terminology of the ISSB standards is suitable for profit-oriented entities, including public-sector business entities. Regardless of whether the entities' financial statements are prepared in accordance with IFRS or other generally accepted accounting principles or practices, an entity may apply the ISSB standards. The standards are not mandatory in nature, but the regulation would depend on the regulatory entity that implements the ISSB standards within each region. Regulators have their own standards, and they often incorporate aspects of the global ISSB standards.

In this section, we will outline the requirements of these two standards, and the implication of those requirements to actuaries.

1.2 SUMMARY OF CORE REQUIREMENTS AND PRINCIPLES

1.2.1 OBJECTIVE AND SCOPE OF IFRS S1

The key objective of IFRS S1 – General Requirements for Disclosures of Sustainability-related Financial Information requires an entity to disclose information about its sustainability-related risks and opportunities useful to primary users of general-purpose financial reports in making decisions. IFRS S1 is an investor-focused standard that lists out the general requirements for the content and presentation of those disclosures. The standard covers sustainability-related risks and opportunities that could reasonably be expected to affect an entity's prospects. An entity may apply this standard regardless of whether it reports its financial statements under IFRS or another set of Generally Accepted Accounting Principles.

IFRS S1 focuses broadly on sustainability-related risks and opportunities. As this paper focuses on climate-related disclosures, the emphasis of this paper is on IFRS S2. However, IFRS S1 does provide the general requirements for improving the quality and reliability of disclosed climate information and how judgments should be applied with uncertainties and errors. The requirements are comparable to Actuarial Standards of Practice, which outline such principles as data quality and communication. Actuaries, therefore, should be aware of these relevant principles to ensure the usefulness of the disclosed information.

1.2.2 IFRS S1 REQUIREMENTS AND PRINCIPLES

The key elements of each section of IFRS S1 are briefly described below. Like other IFRS standards, IFRS S1 takes a balanced approach to promoting reporting principles, such as transparency and accuracy, in the information that is published. IFRS S1 also describes the four key pillars: Governance, Strategy, Risk Management, and Metrics and Targets. These four components can be found in other climate standards and regulations and their widespread use represents a step forward in the convergence of such standards and regulations globally.

1.2.2.1 Conceptual Foundation

To enhance the usefulness of sustainability-related financial information, IFRS S1 introduces the conceptual foundations of the standard, which are the basic principles that help present comparable, verifiable, timely, and understandable information.

Table 1

CONCEPTUAL FOUNDATIONS OF IFRS S1

Conceptual Foundation	Key Concepts
Fair Presentation [IFRS S1.11-16]	All sustainability-related financial disclosures should provide a fair representation with a complete, neutral, and accurate depiction of all relevant sustainability-related risks and opportunities that could reasonably impact an entity's prospect.
Materiality [IFRS S1.17-18 and B29, B31, B34]	Material information is defined as information that, if omitted, misstated, or obscured, could reasonably be expected to influence the decisions of primary users of general-purpose financial reports, which encompass financial statements and sustainability-related financial disclosures, and provide information about a specific reporting entity. All material information that may impact an entity's prospects must be disclosed.
Reporting Entity [IFRS S1.20]	An entity's sustainability-related financial disclosures shall be for the same reporting entity as the related financial statements under IFRS Accounting standards.
Connected Information [IFRS S1.21-24]	Entities are required to provide information that allows users of general-purpose financial reports to understand the connections between sustainability-related risks and opportunities, as well as the connections between disclosures within sustainability-related financial disclosures and across other financial reports. The data and assumptions, along with the presentation currency used in preparing sustainability-related financial disclosures, should be consistent with that in the related financial statements.

1.2.2.2 Core Content

The IFRS S1 standard requires entities to provide disclosures about governance, strategy, risk management, and metrics and targets related to sustainability. This includes information about the governance processes, controls, and procedures used by the entity to monitor and manage sustainability-related risks and opportunities. It also includes the entity's approach to managing these risks and opportunities and the processes used to identify, assess, prioritize, and monitor them. Additionally, the entity is expected to disclose its performance about sustainability-related risks and opportunities, including progress towards any targets set or required by law or regulation.

The difference between the core content in IFRS S1 and IFRS S2 is in their respective scopes, where IFRS S1 encompasses a broader range of sustainability-related issues beyond climate change, like labor practices, human rights, community engagement, and supply chain management. IFRS S2 is more narrowly focused on addressing climate change issues, like greenhouse gas emissions, climate-related risks and opportunities, climate strategy, and resilience to climate impacts. This will be explained in greater detail in subsequent sections.

1.2.2.3 General Requirements

This describes certain other requirements that would improve the quality and reliability of the information provided. These requirements also apply to general purpose financial statements by IFRS and will assist existing IFRS reporters in considering sustainability-related information.

Table 2

GENERAL REQUIREMENTS OF IFRS S1

General Requirements	Key Concepts
Source of Guidance [IFRS S1.54-59]	The entity may refer to and consider the applicability of other sources of guidance and disclosure standards, including the Sustainability Accounting Standards Board (SASB) disclosure topics[3] and Climate Disclosure Standards Board (CDSB) frameworks[4]. These must also be identified in the disclosures.
Location of Disclosures and Timing of Reporting [IFRS S1.60-64]	IFRS S1 describes various locations within the general-purpose financial reports where sustainability-related information can be placed. In addition, sustainability-related financial disclosures must be published simultaneously in the same reporting package, as one or multiple reports, and must cover the same reporting period. There is a specified relief granted to companies in their first year of reporting due to reporting challenges. It allows for jurisdiction-specific requirements on the location of reporting to be accommodated and provides additional information as long as it does not obscure the ones required.
Comparative Information [IFRS S1.70]	Like financial reporting, entities are obligated to disclose comparative information for all amounts disclosed in the current reporting period to enhance understanding and analysis, unless another ISSB Standard allows or requires otherwise.
Statement of Compliance [IFRS S1.72]	IFRS S1 requires companies to make an explicit and unreserved statement of compliance if they meet all the requirements of the ISSB standards. Companies are relieved from disclosing certain information otherwise needed if it is prohibited by law or regulation or is commercially sensitive.

1.2.2.4 Judgements, Uncertainties, and Errors

Aspects more relevant to actuaries are the judgments, uncertainties, and errors that impact an entity's sustainability-related financial disclosures. Actuaries would need to exercise professional judgment in interpreting data, applying assumptions, and advising on calculation methods for sustainability metrics. They would assess the relevance and materiality of information based on factors such as industry, business model, and investor expectations. They would detect and evaluate uncertainties inherent in data, model assumptions, and external factors, using statistical techniques like sensitivity and scenario analysis to quantify and mitigate uncertainties in reporting.

[3] Find your industry - SASB (ifrs.org)

[4] cdsb-framework-2022.pdf (ifrs.org)

1.2.3 OBJECTIVE AND SCOPE OF IFRS S2

The key objective of IFRS S2 Climate-related Disclosures is to require an entity to disclose information about climate-related risks and opportunities that would benefit primary users of general-purpose financial reports in making decisions related to providing resources to the entity. IFRS S2 encompasses both climate-related physical risks and transition risks that an entity may be exposed to, as well as climate-related opportunities available to the entity. Similar to IFRS S1, only material climate-related risks and opportunities are in the scope of the standard.

1.2.4 IFRS S2 REQUIREMENTS AND PRINCIPLES

IFRS S2 is structured around four key categories, or pillars, of disclosure. These are Governance, Strategy, Risk Management, and Metrics and Targets. The core content of IFRS S2 describes, in detail, these four pillars and how each drives the disclosure of climate-related risks and opportunities. These pillars generally align with those of IFRS S1 as discussed earlier but focus on climate rather than sustainability. Having a good understanding of these four pillars will help the actuary to ascertain where within each pillar actuarial skillsets and competencies can contribute.

These four pillars are based on the TCFD recommendations (where they were first introduced), but ISSB standards introduced changes in wording and more detailed requirements. For further understanding, the ISSB published an educational supplement comparing TCFD to IFRS S2[5], which illustrates the key differences between the core content requirements in IFRS S2 and TCFD's core recommendations.

Table 3
THE FOUR PILLARS OF IFRS S2

Pillar	Objective
Governance	To understand the governance processes, controls, and procedures an entity uses to monitor, manage, and oversee climate-related risks and opportunities.
Strategy	To understand an entity's strategy for managing climate-related risks and opportunities.
Risk Management	To understand how an entity identifies, assesses, prioritizes, and monitors climate-related risks and opportunities, and how these processes are integrated into the overall risk management process.
Metrics and Targets	To understand an entity's performance with regard to climate-related risks and opportunities, including progress toward set targets and compliance with legal or regulatory requirements.

The specific requirements of each of the pillars are explained in the sections below.

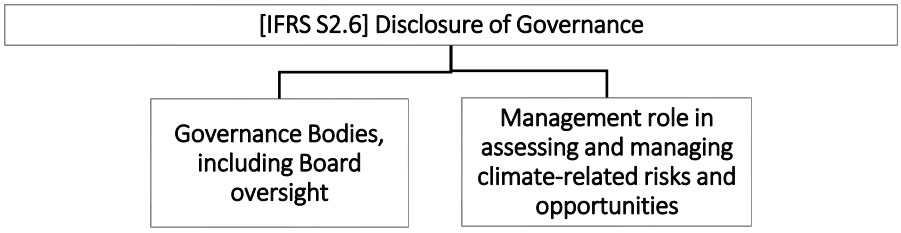
1.2.4.1 Governance

Governance refers to the system by which an organization is directed and controlled in the interest of shareholders and other stakeholders. Investors and other users of climate-related financial disclosures are interested in understanding the role of the board of directors in overseeing climate-related risks and opportunities, as well as management's role in assessing and managing them. Such information supports

[5] *Comparison - IFRS S2 Climate-related Disclosures with the TCFD recommendations*

evaluations of whether the climate-related risks and opportunities receive appropriate board and management attention.

This section requires the disclosure of information on two aspects of governance: The Governance bodies involved and Management's role in the governance process. The information required in the disclosure is summarized below.

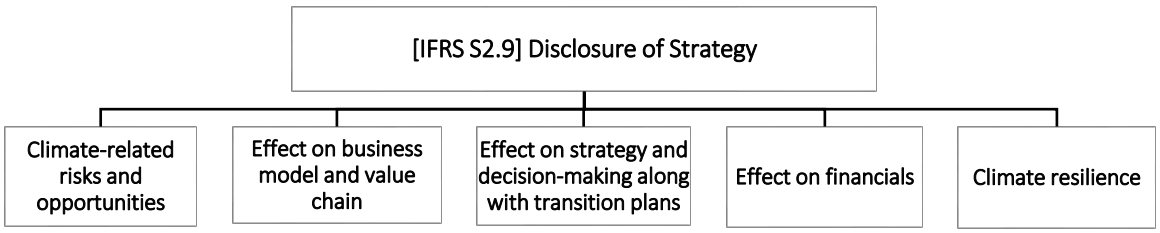


- Governance Bodies
  - How responsibilities are reflected in role descriptions, mandates, and other related policies
  - How the governance body determines whether skills and competencies are appropriate for oversight
  - How and how often the governance body is informed about the risks and opportunities
  - How the governance body takes into account climate-related risks and opportunities when overseeing the entity's strategy
  - How the governance body oversees the setting of targets and monitors progress toward the targets

- Management role
  - Whether the role is delegated to a specific position or committee and how oversight is exercised
  - Whether management uses controls and procedures and how these are integrated with other functions

1.2.4.2 Strategy

Strategy refers to the planning required to reach an organization's desired future state. The disclosure of Strategy is related to the actual and potential impacts of climate-related risks and opportunities on the organization's business, decision-making, and financial planning where such information is material. IFRS S2 specifies five areas to be considered in the strategy disclosure.



- Climate-related Risks and opportunities [IFRS S2.10-12]

An entity shall describe the climate-related risks and opportunities that are expected to impact the entity's prospects [IFRS S2.10(a)]. The requirement emphasizes the differentiation between physical risks and transition risks [IFRS S2.10(b)], and the anticipated time horizons as short, medium, or long-term over which these effects are expected to occur and how they align with the entity's strategic planning horizons [IFRS S2.10(c)-(d)].

- Effect on business model and value chain [IFRS S2.13]

An entity shall describe the current and anticipated effects of the risks and opportunities on the entity's business model and value chain, together with a description of where in the business the risks and opportunities are concentrated.

- Effect on strategy and decision-making [IFRS S2.14]

The entity shall disclose its response to climate-related risks and opportunities in its strategy and decision-making along with how it plans to meet any climate-related targets [IFRS S2.14(a)]. In particular, the disclosure includes changes to the business model and resource allocation, mitigation and adaptation efforts, climate-related transition plans, and climate-related targets [IFRS S2.14(a)(i)-(v)]. The entity shall also disclose information on resourcing and the progress of any climate-related plans disclosed in previous periods [IFRS S2.14(b)-(c)].

- Effect on financials [IFRS S2.15-21]

The requirement focuses on the current and anticipated future effects over the short, medium, and long-term of climate-related risks and opportunities on an entity's financial position, performance, and cash flows. This information should be both qualitative and quantitative. Quantitative information could require the use of climate modeling to determine impacts on future financial statements. In considering how its financial position is expected to change, an entity should also disclose its investment and disposal plans, and the planned sources of funding to implement its strategy.

- Climate Resilience [IFRS S2.22-23]

The Standard specifies the use of climate-related scenario analysis to assess an entity's climate resilience. This is probably the most important and relevant role for actuaries to play in climate risk management because of their expertise in scenario analysis and stress testing. Actuaries would be able to help understand the financial implications of future climate scenarios and develop strategies to mitigate risks and capitalize on opportunities. Scenario analysis would help influence an entity's strategy by:

- Exploring different scenarios and uncovering emerging trends, vulnerabilities, and areas of advantage
- Assessing the potential impacts and likelihood of the risks and opportunities
- Providing valuable insights into the resilience of the organization's current strategies and business model in the face of different climate scenarios
- Disclosing outcomes transparently and increasing trust and credibility

The specific information about climate resilience that must be disclosed is listed below.

Table 4
CLIMATE RESILIENCE DISCLOSURE CATEGORIES AND THEIR REQUIREMENTS

Category	Requirement
Assessment of an Entity's Climate Resilience	[IFRS S2.22(a)(i)] The implications of the entity's assessment for its strategy and business model, including how the entity responds to the effects identified in the scenario analysis [IFRS S2.22(a)(ii)] The significant areas of uncertainty considered in the entity's assessment of its climate resilience [IFRS S2.22(a)(iii)] The entity's capacity to adjust or adapt its strategy and business model to climate change over the time horizon
Scenario Analysis	[IFRS S2.22(b)(i)] Inputs in the analysis a) Which climate-related scenarios are used b) Whether the analysis included a diverse range of scenarios c) Whether the scenarios are associated with transition risks or physical risks d) Whether the scenarios are aligned with the latest international agreement on climate change e) Why the scenarios are relevant to assessing resilience f) Time horizons used in the analysis g) Scope of the entity's operations used in the analysis [IFRS S2.22(b)(ii)] Key assumptions in the analysis a) Climate-related policies in the jurisdictions in which the entity operates b) Macroeconomic trends c) National- or regional-level variables d) Energy usage and mix e) Developments in technology [IFRS S2.22(b)(iii)] Reporting period in which the climate-related scenario analysis was carried out

IFRS S2 is not an industry-specific standard. As such, there are industries that, unlike financial industries, may have little experience with scenario modeling and analysis. Due to the potential resources and skill constraints, the ISSB provided application guidance on scenario analysis to accompany IFRS S2. The application guidance (paragraphs B1–B18 of IFRS S2) draws on the range of practice outlined in documents published by the TCFD. This is explained below.

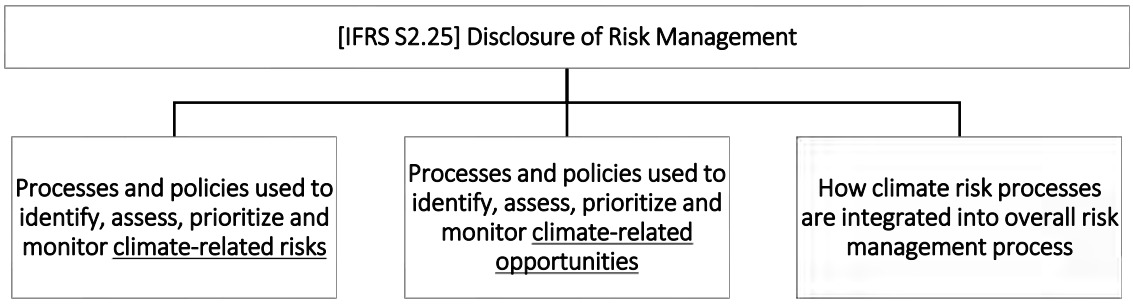
Table 5
APPLICATION GUIDANCE ACCOMPANIED BY IFRS S2

Category	Application Guidance
Assessing the Circumstances [IFRS S2.B2-B7]	An entity shall use an approach to scenario analysis that is commensurate with its circumstances. A more technically sophisticated form of scenario analysis should be adopted when there is: a) Greater exposure to climate-related risks and opportunities b) More developed skills, capabilities, and intensive resources available
Determining the Appropriate Approach [IFRS S2.B8-B15]	The determination of the appropriate approach involves: a) Selecting input, including scenarios, variables, and others • Consider all reasonable and supportable information without undue cost and effort • Consider climate-related scenarios, including international and regional scenarios, and those publicly available from authoritative sources • Inputs should be relevant to the entity's circumstances b) Making analytical choices • Prioritize the analytical choices that will enable consideration of all available information, including qualitative analysis and quantitative modeling • Quantitative information, or qualitative information, either alone or combined, can be used
Additional Considerations [IFRS S2.B16-B18]	a) Scenario analysis is an evolving practice, as the approach and circumstances are likely to change over time b) A simpler approach is allowed if such an approach is appropriate to the entity's situation c) An entity might carry out its climate-related scenario analysis in line with its multi-year strategic planning cycle, thus it could remain unchanged from previous reporting period's mid-cycle

1.2.4.3 Risk Management

From the perspective of IFRS S2, risk management is the process through which an organization identifies, assesses, prioritizes, and monitors climate-related risks and opportunities. The disclosure for this section allows stakeholders to better understand the organization's overall climate-related risk profile and management activities.

Risk Management disclosure requirements are described below.



Disclosure requirements for climate-related risks are more detailed than those for opportunities, reflecting the relative maturity of the risk management processes. IFRS S2 specifies disclosures regarding:

- Processes and policies related to the identification, assessment, prioritization, and monitoring of climate-related risks
  - The inputs and parameters used by the entity
  - Whether and how the entity uses climate-related scenario analysis to inform its identification of climate-related risks
  - How the entity assesses the nature, likelihood, and magnitude of the effects of those risks
  - Whether and how the entity prioritizes climate-related risks relative to other types of risk
  - How the entity monitors climate-related risks
  - Whether and how the entity has changed the processes it uses compared with the previous reporting period

- Processes and policies related to climate-related opportunities
  - Whether and how the entity uses climate-related scenario analysis to inform its identification of climate-related opportunities

- Extent to which the processes above are integrated into the overall risk management framework

1.2.4.4 Metrics and Targets

Disclosing metrics and targets allows stakeholders to better understand an entity's performance regarding climate-related risks and opportunities, including progress toward set targets and compliance with legal or regulatory requirements. Similar to TCFD recommendations, IFRS S2 requires cross-industry metrics that span all industries such as GHG emissions. However, IFRS S2 also specifies the disclosure of industry-based metrics relevant to an entity's business model and activities. In addition, IFRS S2 requires information about financed emissions, reflecting the emphasis on the financing and enablement activities inherent in asset management, commercial banking, and insurance.

The IFRS S2 requirements for the climate-related metrics and targets are listed below.

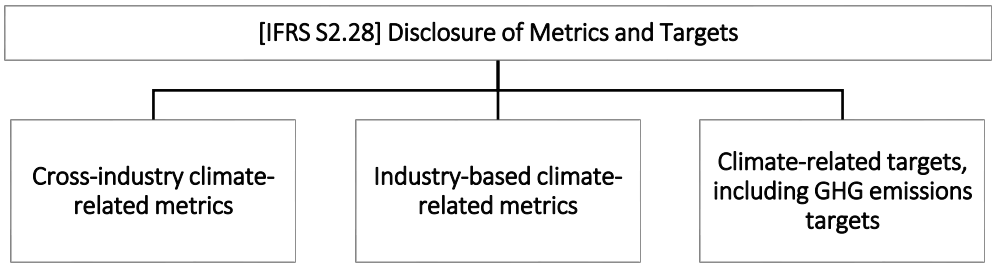


Table 6
IFRS S2 CLIMATE-RELATED METRICS AND TARGETS

Category	Requirements
Cross-industry Climate-related Metrics [IFRS S2.29]	• Greenhouse gases (GHG) emissions o Absolute Scope 1, Scope 2, and Scope 3 GHG emissions, measured in accordance with the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (2004) o Measurement approaches, inputs, and assumptions; reasons for the choices and any changes o Disaggregation of Scope 1 and Scope 2 emissions between the consolidated accounting group and other investees such as joint ventures o Location-based Scope 2 GHG emissions, and any contractual instruments o Categories included in Scope 3 GHG emissions, and additional information about Category 15 (financed emissions) for asset management, commercial banking, and insurance • Climate-related transition risks o Amount and percentage of assets or business activities vulnerable to climate-related transition risks • Climate-related physical risks o Amount and percentage of assets or business activities vulnerable to climate-related physical risks • Climate-related opportunities o Amount and percentage of assets or business activities aligned with climate-related opportunities • Capital deployment o Amount of capital expenditure, financing, or investment allocated to climate-related risks and opportunities • Internal carbon prices o Whether and how the entity applies carbon pricing in decision-making o Price for each metric ton of GHG emissions for assessing the costs of its GHG emissions o Insurance companies can: ▪ Implement internal carbon pricing mechanisms to incorporate the cost of the emissions into their investment decisions, risk assessments, and underwriting practices ▪ Incorporate carbon pricing in insurance premium calculations for high emission industries • Remuneration o Description of how climate-related considerations are integrated into executive remuneration o Percentage of executive management remuneration linked to climate-related considerations

Category	Requirements
Industry-based Climate-related Metrics [IFRS S2.32]	• An entity shall refer to and consider the applicability of the industry-based metrics associated with disclosure topics described in the Industry-based Guidance on Implementing IFRS S2[6]. For industry-based requirements, please refer to subsection 1.2.5.
Climate-related Targets	• Disclosures about qualitative and quantitative targets o The metric used to set the target o The objective of the target o The part of the entity to which the target applies o The period over which the target applies o The base period from which progress is measured o Any milestones and interim targets o If the target is quantitative, whether it is an absolute target or an intensity target o How the latest international agreement on climate change has informed the targets • Target setting and review o Whether the target and the methodology for setting the target have been validated by a third party o The entity's processes for reviewing the target o The metrics used to monitor progress towards reaching the target o Any revisions to the target and an explanation of those revisions
GHG Emissions Targets [IFRS S2.36]	• GHG emissions targets o Which greenhouse gases are covered by the target o Whether Scope 1, Scope 2 or Scope 3 greenhouse gas emissions are covered o Whether the target is a gross GHG emissions target or net GHG emissions target o Whether the target was derived using a sectoral decarbonization approach o Information about the entity's planned use of carbon credits to offset greenhouse gas emissions to achieve any net greenhouse gas emissions target

1.2.5 INDUSTRY-BASED DISCLOSURE REQUIREMENTS

Including industry-based disclosure requirements in IFRS S2 recognizes that different industries face unique climate-related risks and opportunities due to their variations in operations, supply chains, and exposures to climate impacts. Thus, the ISSB created additional content that provides detailed, industry-specific guidance on how to apply the IFRS S2 disclosure requirements. This Industry-based Guidance on implementing climate-related disclosures provides information for the following sectors: Consumer Goods, Extractives and Minerals Processing, Financials, Food and Beverage, Health Care, Infrastructure, Renewable Resources and Alternative Energy, Resource Transformation, Services, Technology and Communications, and Transportation.

In the Financial Sector guidance, disclosures are included for asset management, pensions, commercial banks, investment banking, brokerage, insurance, and mortgage finance industries. These disclosures are vital in offering transparency and insight into operations, risks, and performance. Asset management firms disclose portfolio details and performance metrics, while commercial banks reveal details about loan portfolios and regulatory compliance. Investment banks and brokerages focus on transparency in trading

[6] IFRS-S2-IBG – Issued IFRS Standards

activities, fees, and risk management. Insurance companies disclose underwriting practices, solvency ratios, and reinsurance arrangements, ensuring transparency in their financial health and risk profile. Mortgage finance institutions provide insight into lending practices, credit risk, and compliance with regulations, facilitating informed decision-making for stakeholders.

1.2.5.1 Insurance Industry-based Guidance

Actuaries, concerning the above industries in the Financial Sector, provide a wide range of services in the insurance industry. They help design and manage underwriting portfolios using their expertise in risk assessment and financial modeling. Therefore, this paper will focus primarily on Insurance Industry disclosures.

The insurance industry-based disclosures provide a framework in which to create a tailored risk assessment that is unique to the company's business model. For example, insurers may face increased exposure to climate-related extreme events which impact their underwriting activities and claims experience. The standard encourages insurers to disclose information about new products or initiatives related to climate resilience, such as parametric insurance products for extreme weather events or green insurance products that incentivize sustainable practices.

The proposed metrics in the standard are developed based on the SASB Standard, where broader industry-based sustainability-related metrics are discussed. The companies already applying the SASB standards are in a prime position to apply IFRS S2. Insurance-specific sustainability disclosure topics and metrics are described in the standard as follows:

Table 7

INSURANCE-SPECIFIC SUSTAINABILITY DISCLOSURE TOPICS AND METRICS

Topic	Metric
Incorporation of ESG Factors in Investment Management	Description of approach to the incorporation of environmental, social, and governance (ESG) factors in investment management processes and strategies
Policies Designed to Incentivize Responsible Behavior	Net premiums written related to energy efficiency and low carbon technology
	Discussion of products or product features that incentivize health, safety, or environmentally responsible actions or behaviors
Physical Risk Exposure	Probable Maximum Loss (PML) of insured products from weather-related natural catastrophes
	Total amount of monetary losses attributable to insurance payouts from (1) modeled natural catastrophes and (2) non-modeled natural catastrophes, by type of event and geographical segment (net and gross of reinsurance)
	Description of approach to incorporation of environmental risks into (1) the underwriting process for individual contracts and (2) the management of entity-level risks and capital adequacy
Activity Metrics	Number of policies in force by segment (property and casualty, life, assumed reinsurance)

1.2.5.2 Incorporation of ESG Factors in Investment Management

This requirement is investment-focused and has evolved based on the Principles for Responsible Investment (PRI) Reporting Framework. An entity is required to describe its approach to incorporate ESG factors into its investment management process and strategies. ESG factors, per PRI, encompass considerations that impact investment decision-making, focusing on sustainability, ethical practices, and long-term value creation. Environmental factors (E) include issues such as climate change, resource depletion, and pollution. Social factors (S) encompass human rights, labor standards, diversity, and community relations. Governance factors (G) relate to corporate governance, transparency, ethics, and risk management practices.

Transition risks are a crucial aspect of ESG factors in investment management, extending beyond climate risk to encompass various sustainability areas. These risks refer to the financial risks companies and industries face when transitioning to a more sustainable business model or adapting to shifts in environmental, social, and governance factors. These risks can arise from changes in regulation, technological advancements, shifts in consumer preferences, and other factors impacting the transition to a low-carbon economy and sustainable practices.

In particular, the standard requires an entity to disclose the approach related to:

- Regulatory requirements the entity is subject to that limit the types of allowable investments
- Policies that determine its approach to incorporate ESG factors in its investment management
- Roles and responsibilities of operation, and the approach to conducting ESG-related research and incorporating ESG factors into investment strategies
- Oversight and accountability approach to the incorporation of ESG factors
- Whether the entity conducts scenario analysis or modeling into which the risk profile of future ESG factors is calculated
- ESG factors that are sector or industry-specific, and those that apply more broadly
- Incorporation of ESG factors in strategic asset allocation and allocation of assets between sectors or geographical markets
- How it incorporates ESG factors into the assessment of and influence on the entity's perspective on investment time horizon, risk and return profile, and traditional fundamental factors
- Incorporation of ESG factors in selecting external fund managers and fiduciary managers
- Incorporation of ESG factors in investment activities that should be disaggregated by asset class or by style employed

1.2.5.3 Policies Designed to Incentivize Responsible Behavior

This requirement is underwriting-focused, which encourages insurance entities to seek sustainability-related growth opportunities by underwriting insurance in this area. The disclosure on products related to energy efficiency and low-carbon technology, as well as discussion of how entities incentivize health, safety, or environmentally responsible actions or behaviors, may assist investors in assessing how insurance entities incentivize responsible behavior.

In particular, an entity is required to disclose:

- Net premiums written related to energy efficiency and low carbon technology. The policies should be demonstrated to absorb environmental risks, including renewable energy insurance, energy savings warranties, and carbon capture and storage insurance.
- Discussion of products or product features that incentivize health, safety, or environmentally responsible actions or behaviors. The standard specifies that consumer insurance, commercial insurance, and life insurance segments are in scope. Health insurance policies are covered as part of the Managed Care Industry guidance. The consumer segment includes homeowners, automotive, supplemental health and accident, and other personal insurance. The commercial segment, on the other hand, includes casualty, property, specialty, and financial insurance. The description should include premium discounts and actuarially-adjusted premiums for green properties, low-emission vehicles, safer driving, and healthy behavior. In addition, quantitative measures, such as the number of policies and premiums related to performance on the underwriting of these socially-beneficial products, may be disclosed.

1.2.5.4 Physical Risk Exposure

This requirement focuses on the impact of catastrophic losses associated with extreme weather events on the insurance industry. In particular, an entity is required to disclose:

- Probable Maximum Loss (PML) of insured products from weather-related natural catastrophes. The PML is the anticipated value of the largest monetary loss that could affect the entity's insurance portfolio, resulting from natural perils including hurricanes, tornadoes, tsunamis, floods, droughts, extreme heat, and winter weather. An entity shall disclose the PML using a minimum of three likelihood of exceedance scenarios (2% or 1-in-50-year, 1% or 1-in-100-year, 0.4% or 1-in-250-year) by geographic location and gross and net of catastrophe reinsurance.
- Total amount of monetary losses attributable to insurance payouts from modeled natural catastrophes and non-modeled natural catastrophes. An entity shall disclose the amount of policyholder benefit paid and claims insured on an IFRS 17 basis, resulting from policy losses and benefit expenses by type of catastrophic event and geographical segment (net and gross of reinsurance).
- Description of approach to the incorporation of environmental risks into the underwriting process for individual contracts, and the management of entity-level risks and capital adequacy. The Standard requires disclosure of the details of the approach, such as:
  - The process for identifying and assessing climate-related risks on insurance and reinsurance portfolios by geography, business division, or product segments
  - Time horizon
  - Integration with catastrophic models and how the model outputs inform underwriting decisions
  - Incentives incorporated into the insurance policies
  - Integration process of environmental risks into entity-wide assessment and enterprise risk management framework

1.2.5.5 Activity Metrics

The activity metrics are developed to quantify the scale of specific activities or operations by an entity and are intended for use in conjunction with the other metrics to normalize data and facilitate comparison. An entity is required to disclose the number of policies in force by segment (Property and Casualty (P&C), Life and assumed reinsurance). Additional disaggregation by product line is suggested.

1.3 DISCUSSION OF OTHER SUSTAINABILITY STANDARDS

The ISSB standards are a cumulation of various sustainability standards that have developed over time, each contributing unique elements to the overall framework. In this section, the major sustainability standards will be discussed in chronological order and examine their alignment with the ISSB standards.

1.3.1 GREENHOUSE GAS PROTOCOL

IFRS S2 requires an entity to measure its greenhouse gas emissions in accordance with the *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (2004)* unless required by a jurisdictional authority or an exchange on which the entity is listed to use a different method [IFRS S2.B24]. The GHG Protocol, launched in 1998, is a set of standards and guidance for measuring greenhouse gas emissions from various sources. The GHG Protocol covers both operational and value chain emissions, as well as project-based emission reductions and removals.

The GHG Protocol consists of Standards and Guidance which focus on various users and GHG topics. For financial sectors, GHG Protocol provides the general guideline for calculating Scope 1, Scope 2, and Scope 3

GHG emissions, with additional calculation guidance on the Scope 3 Category 15 (Investment) GHG emissions. This guidance is notable for creating the characterization of GHG emissions in terms of Scopes 1, 2, and 3. This characterization is now widely used in many other climate-related disclosure standards and regulations. The Standards and Guidance most relevant to the financial sector are described below.

- Standards
  - GHG Protocol Corporate Accounting and Reporting Standard – this is developed primarily from the perspective of a business developing a corporate-level GHG inventory and applies equally to all types of organizations with operations that give rise to GHG emissions.
  - Corporate Value Chain (Scope 3) Standard – this provides requirements and guidance for companies and other organizations to prepare and publicly report a GHG emissions inventory that includes indirect emissions resulting from value chain activities (i.e., Scope 3 emissions).
- Guidance
  - Scope 3 Calculation Guidance – this serves as a companion to the Corporate Value Chain (Scope 3) Standard. Guidance for calculating GHG emission for each of the 15 Scope 3 categories, data sources, and worked examples are provided.

The Global GHG Accounting and Reporting Standard for the Financial Industry – In response to financial industry demand for a consistent approach to measure Scope 3 Category 15 (Investment), the Partnership for Carbon Accounting Financials (PCAF) standards are developed to cover the calculation methodology for financed emissions, facilitated emissions, and insurance-associated emissions.

1.3.2 GLOBAL REPORTING INITIATIVE (GRI) STANDARDS

The GRI standards, with first guideline launched in 2000, are one of the first and most widely used global standards for sustainability reporting and disclosure. They provide a comprehensive and flexible framework for reporting on the environmental, social, and governance impacts of an organization's activities.

1.3.2.1 GRI Standards Structure

The GRI standards function as a cohesive and interlinked system of multiple standards. The reporting process is facilitated by three distinct series of standards:

- GRI Universal Standards
  - The Universal standards incorporate reporting on human rights and environmental due diligence, in line with intergovernmental expectations. It consists of three standards – namely,
    - *GRI 1 Foundation* – outlines the requirements and principles for using the GRI standards.
    - *GRI 2 General Disclosures* – outlines disclosures related to an organization's structure and reporting practices.
    - *GRI 3 Material Topics* – outlines the process to determine an organization's most material topics, along with how the Sector standards are implemented in this process.

- GRI Sector Standards
  - Each Sector Standard enumerates the likely material topics for the sector and suggests pertinent disclosures for reporting on these topics. The standards will eventually be developed for 40 sectors, prioritizing those with the most significant impacts. To date, Sector standards have been drafted for Oil and Gas, Coal, Agriculture/Aquaculture/Fishing, and Mining sectors. Currently the GRI standards do not have Sector standards for financial

services. The Sector standards related to Banking, Capital Markets, and Insurance sectors will be released in the third quarter of 2025[7].

- GRI Topic Standards,
  - Each Topic Standard lists out the disclosures relevant to a material topic. Instances related to climate change include Standards on Economic Performance, Energy, and Emissions and Climate Change (to be released in the fourth quarter of 2024). An organization chooses the Topic Standards that align with the material topics it has identified and utilizes them for its reporting.

1.3.2.2 Use of GRI Standards for implementing ISSB Standards

The GRI standards are referenced as sources of guidance for IFRS S1. An entity shall apply judgement to identify information that is relevant to the decision-making of users of general-purpose financial reports and faithfully represents that sustainability-related risk or opportunity [IFRS S1.C1 - C2]. In making that judgement, an entity may—to the extent that these sources assist the entity in meeting the objective of IFRS S1 and do not conflict with IFRS Sustainability Disclosure Standards—refer to and consider the applicability of:

- the GRI Standards; and
- the European Sustainability Reporting Standards (ESRS).

In this section, the GRI Standard will be discussed for the purpose of meeting the objectives of IFRS S1 and IFRS S2. The ESRS will be discussed in Section 2.

While the ISSB standards are focused on the information needs of investors, GRI seeks to meet the broader information needs of other stakeholders. From an insurance industry standpoint, GRI standards are perhaps less useful for guiding insurance professionals in insurance-based climate-related disclosure. Unlike ISSB standards, GRI standards have less focus on climate risk management and climate resilience as part of Strategy. However, given the focus on carbon-intensive industries, GRI standards provide much more detailed guidance on specific topics like GHG emissions, energy, adaption plans, and climate transition plans.

[7] Sector Standards Project for Financial Services
https://www.globalreporting.org/standards/standards-development/sector-standards-project-for-financial-services/

A high-level comparison between the GRI standards and IFRS S1 and IFRS S2 is summarized below.

Table 8
COMPARISION BETWEEN ISSB AND GRI STANDARDS

Standards	ISSB	GRI	Remark
Sustainability Standards	IFRS S1	Universal standards: GRI 1: Foundation 2021 GRI 2: General Disclosure 2021 GRI 3: Material Topics 2021 Topic standards covering various sustainability and climate topics	Both list out the reporting general requirements and principles for sustainability-related information. ISSB standards do not have a separate standard for material topics. However, IFRS S1 introduces the concept of "materiality," which is applicable for disclosing sustainability-related information. Therefore, the two standards take very different approaches to determining materiality.
Climate Standards	IFRS S2	GRI CC-Climate Change, expected in 2024 Topic standards – GRI 201 Economic Performance (Disclosure 201-2 Financial implications and other risks and opportunities due to climate change) Topic standards – GRI 305 Emissions 2016	ISSB standards adopt a "top-down" approach, which covers sustainability (IFRS S1) and climate (IFRS S2) in a general, principles-based way. GRI standards adopt a "bottom-up" approach that consists of various specific topics related to climate and sustainability that are of acute importance to member companies.
Industry-based Climate-related Standards	IFRS S2 Appendix – Industry-based disclosure This includes financial services of which insurance is a component.	Sector Standards, where financial service sector is under development	Currently, the GRI standards do not have Sector standards for financial services. The standards related to Banking, Capital Markets and Insurance sectors will be released in the third quarter of 2025.
Audience	Investor-focused	Broader stakeholders, like investors, customers, regulators, and wider public	As GRI does not only focus on financial disclosure, the target audience extends beyond investors.

1.3.3 CARBON DISCLOSURE PROJECT (CDP)

The CDP was founded in 2000 to provide a global disclosure platform for companies, cities, states, and regions to measure and disclose vital information on their environmental impacts. CDP accomplishes this by translating climate disclosure standards into industry-specific questionnaires covering Climate Change, Water Security, and Forests. To encourage and steer businesses towards becoming pioneers in environmental transparency and action through the process of disclosure, CDP annually evaluates a company's environmental performance and makes the scores publicly available.

Table 9
SECTOR SPECIFIC CDP QUESTIONNAIRE

Groups	Climate Change Questionnaire	Water Security Questionnaire	Forests Questionnaire
Energy	• Oil and gas • Coal • Electric utilities	• Oil and gas • Coal • Electric utilities	• Coal
Transport	• Transport original equipment manufacturers • Transport services	N/A	N/A
Materials	• Cement • Steel • Metals and mining • Chemicals • Construction • Real estate • Capital goods	• Metals and mining • Chemicals	• Metals and mining
Agriculture	• Food, beverage, and tobacco • Agricultural commodities • Paper and forestry	• Food, beverage, and tobacco • Agricultural commodities	• Paper and forestry
Financial	• Financial Services	N/A	N/A

Source: CDP Technical Note on the TCFD[8]

Through the self-reported data they collect, the CDP currently maintains the largest dataset of environmental disclosure data with more than 21,000 companies reporting, where 575 financial institutions disclosed to the Financial Services questionnaire in 2023[9]. Although the number of financial institutions providing reports to the CDP has been increasing each year, there are still numerous entities that have not yet utilized the platform for reporting. We anticipate that the significance of CDP reporting will probably increase as the platform integrates the new ISSB standards.

In 2022, the CDP and the IFRS Foundation jointly announced a significant development whereby the CDP decided to incorporate the IFRS S2 framework into its worldwide environmental disclosure platform[10]. This crucial move paves the way for establishing a comprehensive global benchmark for capital markets through the adoption of ISSB standards. The announcement means that voluntary users of CDP will disclose data aligned with IFRS S2 in the 2024 disclosure cycle.

[8] CDP Technical Note on the TCFD cdn.cdp.net/cdp-production/cms/guidance_docs/pdfs/000/001/429/original/CDP-TCFD-technical-note.pdf?1512736184
[9] CDP 2023 disclosure data factsheet https://www.cdp.net/en/companies/cdp-2023-disclosure-data-factsheet
[10] ISSB at COP27: CDP to incorporate ISSB Climate-related Disclosures Standard into global environmental disclosure platform https://www.ifrs.org/news-and-events/news/2022/11/cdp-to-incorporate-issb-climate-related-disclosure-standard-into-global-environmental-disclosure-platform/

In the CDP Climate Change 2023 questionnaire, questions are categorized into 15 modules aligned with TCFD and other sustainability frameworks. Further alignment with IFRS S2 is expected as part of the 2024 disclosure. The modules include:

- C1 Governance – Board oversight, management responsibility, employee incentives, and retirement schemes
- C2 Risks and Opportunities – Management process, risk disclosure, and opportunity disclosure
- C3 Business Strategy – Climate transition plan, scenario analysis, and business strategy on financial services
- C4 Targets and Performance – Emissions targets and other climate-related targets, emissions reduction initiatives, and low carbon products

1.3.4 SUSTAINABILITY ACCOUNTING STANDARDS BOARD (SASB) STANDARDS

The SASB standards, launched in 2011, are designed to identify and standardize disclosure for the sustainability issues most relevant to investor decision-making in each of 77 industries. The ISSB's standards require industry-specific disclosures, and companies are required to refer to and consider the SASB standards to identify sustainability-related risks, opportunities, and related metrics. The companies already applying the SASB standards are in a prime position to apply the IFRS S1 and IFRS S2.

1.3.4.1 The Role of SASB Standards in IFRS S1

IFRS S1 applies to all sustainability-related risks and opportunities but does not specify what those risks and opportunities are. Per IFRS S1.55, in addition to IFRS Sustainability Disclosure Standards, an entity shall refer to and consider the applicability of the disclosure topics in the SASB standards.

To identify their sustainability-related risks and opportunities and provide appropriate disclosures using IFRS S1, entities will be required to consider the SASB standards for topics beyond climate. In February 2024, the ISSB and SASB jointly developed educational material using the SASB standards to meet the requirements in IFRS S1[11]. The document outlines stepwise guidance to meet the requirements in IFRS S1 with SASB standards, including (i) identify the relevant industry Standard(s), (ii) identify relevant disclosure topics, (iii) identify relevant metrics, and (iv) develop disclosures using technical protocols.

1.3.4.2 The Role of SASB Standards in IFRS S2

IFRS S2 provides industry-based disclosure about climate-related risks and opportunities to meet investor information needs. In June 2023, SASB standards were updated to align with the industry-based guidance accompanying IFRS S2[12]. This section will discuss the December 2023 version of the SASB insurance industry-based disclosure and the comparison with IFRS S2.

Similar to IFRS S2 industry-based disclosure, SASB standards specify the sustainability disclosure topics and metrics along with technical protocols, which provide guidance on the implementation of associated metrics. The table below outlines the required topics and metrics in both SASB and IFRS S2. The two standards for the insurance industry are largely aligned, except that SASB standards also includes non-climate-related topics and metrics (i.e., Transparent Information & Fair Advice for Customers and Systematic Risk Management).

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[11] Using the SASB Standards to meet the requirements in IFRS S1 using-sasb-standards-for-ifrs-s1.pdf

[12] ISSB issues global inaugural IFRS Sustainability Disclosure Standards, updates SASB Standards https://sasb.ifrs.org/blog/issb-issues-global-inaugural-ifrs-sustainability-disclosure-standards-updates-sasb-standards/

Table 10

COMPARISION BETWEEN SASB STANDARDS AND IFRS S2

Topic	Metric	SASB	IFRS S2
Transparent Information & Fair Advice for Customers	Total amount of monetary losses as a result of legal proceedings associated with marketing and communication of insurance product-related information to new and returning customers	Required	N/A
	Complaints-to-claims ratio	Required	N/A
	Customer retention rate	Required	N/A
	Description of approach to informing customers about products	Required	N/A
Incorporation of ESG Factors in Investment Management	Description of approach to incorporation of ESG factors in investment management processes and strategies	Required	Required; same as SASB
Policies Designed to Incentivize Responsible Behavior	Net premiums written related to energy efficiency and low carbon technology	Required	Required; same as SASB
	Discussion of products or product features that incentivize health, safety, or environmentally responsible actions or behaviors	Required	Required; same as SASB
Financed Emissions	Absolute gross financed emissions, disaggregated by Scope 1, Scope 2 and Scope 3	Required; same as ISSB standards	Required per IFRS S2.B63
	Gross exposure for each industry by asset class	Required; same as ISSB standards	Required per IFRS S2.B63
	Percentage of gross exposure included in the financed emissions calculation	Required; same as ISSB standards	Required per IFRS S2.B63
	Description of the methodology used to calculate financed emissions	Required; same as ISSB standards	Required per IFRS S2.B63
Physical Risk Exposure	PML of insured products from weather-related natural catastrophes	Required	Required; same as SASB
	Total amount of monetary losses attributable to insurance payouts from (1) modeled natural catastrophes and (2) non-modeled natural catastrophes, by type of event and geographical segment (net and gross of reinsurance)	Required	Required; same as SASB
	Description of approach to incorporation of environmental risks into (1) the underwriting process for individual contracts and (2) the management of entity-level risks and capital adequacy	Required	Required; same as SASB
Systemic Risk Management	Exposure to derivative instruments by category: (1) total exposure to noncentrally cleared derivatives, (2) total fair value of acceptable collateral posted with a central clearinghouse, and (3) total exposure to centrally cleared derivatives	Required	N/A
	Total fair value of securities lending collateral assets	Required	N/A
	Description of approach to managing capital and liquidity-related risks associated with systemic non-insurance activities	Required	N/A
Activity Metrics	Number of policies in force, by segment: property and casualty, life, assumed reinsurance	Required	Required; same as SASB

1.3.5 TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURE (TCFD)

The TCFD was an initiative established by the FSB in 2015 to develop a set of voluntary and consistent recommendations for disclosing climate-related risks in financial filings. The disclosure framework is structured around the four key pillars of Governance, Strategy, Risk Management, and Metrics and Targets. This was the first publication to frame climate-related disclosures in this way.

Prior to the establishment of the ISSB standards, investors coalesced around a combination of the TCFD recommendations and SASB standards as a fundamental basis to provide sustainability-related financial disclosures. The ISSB, formed in 2022, consolidated the SASB along with other related organizations. In addition, ISSB standards fully incorporate the TCFD with some additional requirements, so companies applying IFRS S1 and IFRS S2 will meet the TCFD recommendations. Following the publication of the ISSB standards, the FSB has asked the IFRS Foundation during 2024 to take over the monitoring of progress on companies' climate-related disclosures from the TCFD[13] and, hence, the TCFD has fulfilled its remit and disbanded.

In general, the core content requirements of TCFD do not fully align with the climate-specific requirements in IFRS S2. In this context, the IFRS Foundation has published a document, Comparison – IFRS S2 Climate-related Disclosures with the TCFD recommendations[14], which indicates that the requirements in IFRS S2 integrate, and are consistent, with the TCFD's four core recommendations and eleven recommended disclosures with minor differences. To transition from TCFD recommendations to the ISSB standards, companies applying TCFD should identify the gaps between the disclosure requirements of the TCFD recommendations and IFRS S2.

1.3.6 PARTNERSHIP FOR CARBON ACCOUNTING FINANCIALS (PCAF)

As discussed in subsection 1.3.1., as part of the GHG Protocol development for the Financial Industry, the PCAF standards, initially launched in 2019, have developed guidance on calculating Scope 3 emissions in the three categories described below.

- Part A: Financed emissions – covers the indirect GHG emissions resulting from investment for seven asset classes. This accounts for the GHG emissions attributable to projects or companies that banks or investors have provided money to in the form of lending or investment. In other words, financed emissions measure the carbon footprint associated with the investments and loans made by financial institutions.
- Part B: Facilitated emissions – covers the indirect GHG emissions resulting from capital markets issuances. This is similar to Financed Emissions, but focuses on the raising of debt, equity, and other funds in capital markets to promote economic activity.
- Part C: Insurance-associated emissions -– covers indirect GHG emissions resulting from re/insurance underwriting on commercial lines and personal auto lines.

[13] IFRS Foundation welcomes culmination of TCFD work and transfer of TCFD monitoring responsibilities to ISSB from 2024 https://www.ifrs.org/news-and-events/news/2023/07/foundation-welcomes-tcfd-responsibilities-from-2024/

[14] Comparison – IFRS S2 Climate-related Disclosures with the TCFD recommendations ifrs-s2-comparison-tcfd-july2023.pdf

1.3.6.1 PCAF Part A: Financed Emissions

The intended users of this Standard are banks, asset managers, and insurance companies. To ensure consistent reporting, the financed emission standard requires financial institutions to adopt either the operational or financial control approach for measuring and reporting their GHG emissions. In most cases, whether an operation is controlled by the company or not does not differ between the two approaches.

- Financial control approach – account for 100% of emissions for all activities in the company where it can directly influence financial and operational policies and has the potential to benefit economically from the company's activities.
- Operational control approach – account for 100% of emissions from operations over which it or one of its subsidiaries has control and the authority to introduce and implement operational policies.

Financed emissions are measured based on a "Follow the money" principle, meaning that the money should be followed as far as possible to understand and account for the climate impact in the real economy. GHG emissions from loans and investments should be allocated to reporting financial institutions based on the proportional share of lending or investment in the borrower or investee. In general, financed emissions are calculated by multiplying an attribution factor by the emissions of the borrower or investee.

$$Financed\ emissions = \sum_i Attribution\ factor_i \ \ X \ \ Emissions_i$$

$$(where\ i = borrower\ or\ investee)$$

$$Attribution\ factor_i \ = Outstanding\ amount_i \ / \ (Total\ equity + debt_i)$$

The standard covers seven common asset classes. For each of the asset class, the attribution factor and emissions are provided.

Table 11
ASSET CLASSES WITH THEIR ATTRIBUTION FACTORS AND EMISSIONS

Asset Class	Attribution Factor	Emissions
Listed Equities and Corporate Bonds	For listed companies Outstanding amount / Enterprise value including cash[15] For bonds to private companies Outstanding amount / (total equity + debt) Where outstanding amount is market value of outstanding listed equity, or book value of outstanding corporate bonds	Borrower or investee's emissions
Business Loans and Unlisted Equity	For business loans and equity investment to/in private companies Outstanding amount / (total equity + debt) For business loans to listed companies Outstanding amount / Enterprise value including cash Where outstanding amount is value of debt owed to the lenders, or outstanding value of unlisted equity that the company holds in a private company	Borrower or investee's emissions
Project Finance	Outstanding investment / (total equity + debt) Where outstanding investment can be amount of debt or equity provided by the individual financier	Project emissions
Commercial Real Estate	Outstanding amount / property value at origination Where the outstanding amount is the outstanding investment amount for investors	Building emissions
Mortgages	Outstanding amount / property value at origination Where the outstanding amount is the outstanding loan amount for loan providers	Building emissions
Motor Vehicle Loans	Outstanding amount / vehicle value at origination Where outstanding amount is value of debt that the debtor owes to the creditor	Vehicle emissions
Sovereign Debt	Exposure to sovereign bond / Purchase-power-parity (PPP)-adjusted Gross Domestic Product (GDP)[16]	Sovereign emissions

[15] Enterprise value including cash (EVIC) is defined as the sum of the market capitalization of ordinary shares at fiscal year-end, the market capitalization of preferred shares at fiscal year-end, and the book values of total debt and minorities' interests. No deductions of cash or cash equivalents are made to avoid the possibility of negative enterprise values.
[16] Purchase-power-parity (PPP)-adjusted GDP is the value of a country's output as a proxy for the 'value of the country,' adjusted by the PPP factor to improve the comparison between the actual economy sizes.

The PCAF Financed Emission Standard developed reporting requirements and recommendations to complement existing sustainability frameworks, including ISSB standards, covering the following key aspects below. In general, PCAF recommends more detailed disclosure on avoided emissions, emissions removal, and emission intensities. For data quality, IFRS S2 is more principle-based, which specifies the characteristics of the prioritized inputs and assumptions. While PCAF also prioritizes reliable data, it introduces a data quality score, which quantifies the reliability of the data used to calculate the Scope 3 GHG emissions.

Table 12
PCAF FINANCED EMISSION STANDARD AND IFRS S2

Areas	PCAF Financed Emissions	IFRS S2
Gases and Units	Required to account for seven gases under the Kyoto Protocol; measured in carbon dioxide equivalents	[IFRS S2.B20] The entity shall aggregate the seven constituent greenhouse gases into CO2 equivalent values.
Absolute Emissions (Scope 3)	Required to disclose absolute Scope 1 and Scope 2 emissions of loans and investments, combined or separated Required to disclose absolute Scope 3 emissions of loans and investments, separately Required to report carbon credits separately Required to disclose disaggregation by asset class or sector level	[IFRS S2.B63(a)] An entity shall disclose its absolute gross financed emissions, disaggregated by Scope 1, Scope 2, and Scope 3 greenhouse gas emissions, for each industry by asset class.
Avoided Emissions and Emission Removal	Recommend disclosing emission removals relevant to the loans and investments; optional for the avoided emissions of renewable power projects	Not required for avoided emissions and emission removal. However, [IFRS S2.3I)] states that carbon credits acquired through carbon reduction or removal should be disclosed.
Emission Intensity	Recommend disclosing, whenever relevant to the business goals, economic emission intensity and physical emission intensity	[IFRS S2.BC82-84] Emission intensity is not explicitly required by IFRS S2 but, per IFRS S1, an entity is required to disclose emission intensity if that information is material.
Data and Data Quality	Recommend disclosing description of types and sources of data, and a weighted score of the data quality, separately for Scope 3 from Scope 1 and Scope 2 In general, the features below have higher data quality scores: • Reported emissions (vs physical activity-based and economic activity-based emissions) • Direct measurement based on physical activity (vs economic-activity-based) • Verified data	[IFRS S2.B40] This Standard does not specify the inputs the entity is required to use to measure its Scope 3 GHG emissions, but does require the entity to prioritize inputs and assumptions using these identifying characteristics: • Data based on direct measurement • Data from specific activities within the entity's value chain • Timely data that faithfully represents the jurisdiction of, and the technology used for, the value chain activity and its GHG emissions • Data that has been verified

1.3.6.2 PCAF Part B: Facilitated Emissions

The intended users of this Standard are those who raise funding in Capital Markets such as governments and private sector companies. Facilitated emissions cover the emissions associated with primary capital market issuance (new public debt and equity, facilitated debt and equity investment in private companies) and loan syndication. To quantify and attribute the facilitated emissions from primary issuance of the capital market instrument, PCAF proposed that three major components need to be considered: (1) Annual emissions of the facilitation activity, (2) Attribution factor defined as facilitated amount over company value, and (3) Weighting factor capturing the responsibility of the facilitator for the issuer's emissions valued. The multiplication of the three components is the attributed facilitated emissions. Given the minimal involvement of actuaries in the primary capital markets, the discussion of facilitated emissions is beyond the scope of this paper.

1.3.6.3 PCAF Part C: Insurance-Associated Emissions

The intended users of this Standard are insurance companies with personal auto lines and commercial lines. The approach for the two lines can also be applied to facultative reinsurance. However, other personal lines, any life or health insurance, and personal accident lines have yet to be addressed.

Unlike financed emissions using a "Follow the money" principle, the insurance-associated emission standard adopts a "Follow the risk" principle, which looks at the insurance risk transfer. The re/insurers are considered as "enablers" of insured vehicles or insured company economic activity, such that the attributed emissions of the re/insurers depend on the "enabling effect" of insurance on the value chain of insured objects.

Under this principle, double counting of emissions can occur between insurance and asset management activities. Therefore, PCAF has proposed that insurance-associated emissions are reported as a supplementary note to its Scope 3 category 15 (Investments) and should not be aggregated to financed emissions.

In general, the insurance-associated emissions are calculated by multiplying an attribution factor by the emissions of the insured.

$$\textit{Insurance-associated emissions} = \sum_i \textit{Attribution factor}_i \;\; X \;\; \textit{Emissions}_i$$

(where i = insured)

$$\textit{Attribution factor}_i = \textit{Share of the emission to be associated with the re/insurer}$$

The standard covers both personal auto lines and commercial lines. For each line, the attribution factor and emissions are provided.

Table 13
PRODUCT LINES WITH THEIR ATTRIBUTION FACTORS AND EMISSIONS

Product Line	Attribution Factor	Emissions
Commercial	Reinsurance or insurance premium / Customer revenue Where the premium is gross written premium minus external acquisition costs	Emissions of the insured company
Personal Auto	• Industry method Insurance industry's total premium from the personal auto line / total costs associated with vehicle ownership of all vehicles • Individual method Insurer-specific premium from the personal auto line / total costs associated with vehicle ownership of the portfolio of vehicles	Emissions of the insured vehicles

Similar to financed emissions, the PCAF insurance-associated emission standard developed reporting requirements that are largely consistent with those for financed emissions, with additional insurance-specific requirements on data and data quality.

- The data quality score is weighted by outstanding premium
- Recommends reconciling the premium figures in the reporting with the premium figures cited in the annual accounts. The re/insurers should explain why they are unable to reconcile.
- Recommends explaining any factors that drive volatility in the insurance-associated emissions

1.4 TAKEWAYS

The primary purpose of a sustainability standard is to ensure consistency of the sustainability disclosure. However, various standards are designed to meet their own specific goals and target audience. A one-size-fits-all standard for sustainability reporting does not exist, and it is unlikely there ever will be one, despite the fact that it would undoubtedly streamline the reporting landscape. To determine the appropriate sustainability standard to be used for an entity, users should understand the focus of the standards, and cross-reference to the standards to ensure the usefulness of the sustainability information.

For instance, materiality is a key concept in sustainability reporting, and primarily determines the scope and relevance of the information being reported. The ISSB, TCFD, and SASB adopt "single materiality," which considers a sustainability-related issue material if it is believed to have a significant impact on the financial condition or operating performance of the company. On the other hand, GRI and CDP extend the concept to "double materiality," which considers not only the impact of sustainability issues on the company as in single materiality, but also the impact of the company's activities on society and the environment.

The table below summarizes the features for each standard discussed in this section.

Table 14

SUMMARY AND COMPARISION AMONG THE DISCUSSED SUSTAINABILITY STANDARDS

Standards	ISSB	GHG Protocol	GRI	CDP	SASB	TCFD	PCAF
Initial Launch Year	2023	1998	2000	2000	2011	2015	2019
Scope	Sustainability, Climate	Scope 1, 2, and 3 GHG	Sustainability, Climate	Sustainability, Climate	Sustainability, Climate	Climate	Scope 3 Investment GHG
Applicability	Entities with related financial statements that are prepared in accordance with IFRS or other general accepted accounting principles or practices	Any organization reporting GHG emissions	Any organization, more focused on carbon-intensive industries	Companies, cities, states, and regions	Companies across the described industries	Any public companies	Financial institutions
Financial Industry Disclosure Covered?	Yes	Yes	To be released in 2024	Yes	Yes	Yes	Yes
Regulation	Voluntary; up to jurisdictional discretion	Voluntary; up to jurisdictional discretion	Voluntary; up to jurisdictional discretion	Voluntary; up to jurisdictional discretion	Voluntary; up to jurisdictional discretion	Voluntary; up to jurisdictional discretion	Voluntary; up to jurisdictional discretion
Assurance	No explicit requirement	No explicit requirement	No explicit requirement	No explicit requirement	No explicit requirement	No explicit requirement	No explicit requirement
Materiality	Single materiality	N/A	Double materiality	Double materiality	Single materiality	Single materiality	N/A
Climate Stress Testing	Covered as strategy	N/A	Not covered	Covered as business strategy	Not covered	Covered as strategy	N/A
Primary Audience	Investors and other stakeholders	Broader range of stakeholders	Broader range of stakeholders	Broader range of stakeholders	Investors and other stakeholders	Investors and other stakeholders	Investors and other stakeholders

In general, the various sustainability standards are being evolved to align with the ISSB standards. Companies adopting existing sustainability frameworks should be aware of the updates and gaps with ISSB standards. In particular,

- GHG Protocol and PCAF are the technical guidance for measuring GHG emissions, particularly on Scope 3 category 15 Investment emissions, which could be significant for financial institutions. Companies would have to consider their methodology to comply with the GHG measurements as part of IFRS S2.
- GRI is developing a Climate Change Topic standard with detailed requirements on climate-related transition plans and adaptation plans, GHG emissions measurements, carbon reduction, and removals. To bridge the gap with ISSB standards, GRI is also developing Sector standards for Financial Services to further align the IFRS S2 industry-based guidance.

- The climate change-related questionnaire of CDP will be updated to align with IFRS S2 as part of the 2024 disclosures. Companies disclosing information to CDP will be expected to meet the ISSB standards.
- SASB has been updated to align with IFRS S2 industry-based guidance on financed emissions and other metrics. Additional metrics on sustainability are being developed in addition to climate-related metrics. Companies applying SASB disclosure would be in a prime position for meeting IFRS S2 industry-based requirements.
- For the TCFD framework, as the basis of formation for ISSB standards, though not fully aligned with IFRS S2, entities currently adopting TCFD should identify the additional requirements of IFRS S2 in order to comply with the new ISSB standards.

These developments reflect the trend of adopting ISSB standards as a global sustainability guideline for climate-related financial disclosure. However, there is still a need to judgmentally cross-reference with other standards in the absence of specific requirements.

Section 2: Regulations

This section primarily focuses on climate-related disclosure regulations in the U.S., Canada, and Europe. This paper distinguishes climate-related disclosure regulations as legally binding requirements set by governments or regulatory bodies that require companies to report specific climate-related information. In contrast, climate disclosure standards are voluntary guidelines created by non-governmental organizations or industry groups to help organizations consistently disclose their environmental impacts and climate-related risks. However, climate-related disclosure regulations often draw upon or incorporate elements from widely accepted climate disclosure standards. The regulations discussed in this section are those that are considered to be of greatest relevance to financial institutions within each region. We will explore the difference between the ISSB standards and the local regulations in this section. The table below provides a high-level summary comparison of the regulations discussed in this section as a reference.

Table 15
COMPARISON OF SELECT CLIMATE REGULATIONS AND ISSB STANDARDS

	ISSB Standards	U.S.	Canada	European Union
Guideline of the Regulation	N/A – The ISSB sets sustainability standards, but regulation would depend on the regulatory entity that implements the ISSB standards within each region. Regulators have their own standards, and they often incorporate aspects of the global ISSB standards	The Enhancement and Standardization of Climate-Related Disclosures for Investors, or "Final rules"	Guideline B-15 - Climate Risk Management	European Sustainability Reporting Standards (ESRS)
Regulator		**U.S. Securities and Exchange Commission**: oversees participants in the securities markets in the U.S. to protect investors, ensure efficient markets, and provide transparent market information.	**Office of the Superintendent of Financial Institutions**: oversees federally regulated financial institutions (banks, insurance, etc.) to ensure the safety and soundness of financial institutions and the Canadian financial system.	The standards are adopted by the **European Commission,** but are regulated by the relevant entity within each country. For example, in France, the rules would be enforced by the Autorité des Marchés Financiers, a financial markets regulator.
First Reporting Period	2024	2025	2024	2024
Affected Companies	Public and private companies, with related financial statements prepared in accordance with IFRS or other general accepted accounting principles or practices Global subject to jurisdictional regulatory adoption	Public companies registered with the SEC	All FRFIs under OSFI except for foreign bank branches.	Public and private companies in the EU and subsidiaries of non-EU companies when certain criteria are met
Reporting Level	The level of reporting entity that is required to prepare the general-purpose financial statements (i.e., the parent and its subsidiaries)	Consolidated parent company level	Highest consolidated level, i.e., non-FRFI parent level or group level	Consolidated parent company level; exempt for subsidiaries if their parent produces a Corporate Sustainability Reporting Directive-compliant consolidated sustainability report

	ISSB Standards	U.S.	Canada	European Union
				(see below for more details)
GHG Emission Disclosures	Scopes 1, 2, and 3: subject to materiality	Scopes 1 and 2: required if material; Scope 3: excluded	Scopes 1, 2, and 3	Scopes 1, 2, and 3: subject to materiality
Climate-related Risks and Opportunities Disclosure	Both required	Risks: required Opportunities: optional	Both required	Both required
Industry specific Metrics	Provided	Not provided	Plans to supplement disclosure (TBD).	Developing
Scenario Analysis	Required	Not required	Required	Required
Materiality	Single	Single	Single	Double
Assurance on Climate-related Information	Not mandated	Limited assurances	Not mandated	Limited assurance
Penalties for Non-compliance	Yes - Subject to jurisdictional authority discretion	Yes	Not explicitly mentioned	Yes - Subject to EU member state laws

2.1 U.S. – SECURITIES AND EXCHANGE COMMISSION ENHANCEMENT AND STANDARDIZATION OF CLIMATE-RELATED DISCLOSURES

2.1.1 INTRODUCTION

The U.S. Securities and Exchange Commission (SEC), the federal agency responsible for regulating the securities industry and protecting investors, issued the Enhancement and Standardization of Climate-Related Disclosures for Investors ("final rules") in March 2024. The final rules consist of amendments to the SEC's governing rules and regulations, namely Regulation S-X[17], Regulation S-K[18], Regulation S-T[19], the Securities Act, and the Exchange Act. These amendments, aimed at improving transparency and helping investors make more informed decisions related to environmental sustainability and climate change impacts, will require registrants to provide certain climate-related information in their registration statements and annual reports. The final rules reflect several differences from the initially proposed rules in 2022[20], aiming to streamline requirements and provide companies with more time to implement disclosures and related assurance requirements. Companies are not mandated to provide Scope 3 greenhouse gas (GHG) emission disclosures, and their financial statement disclosure requirements are less extensive than the ISSB standards. Disclosures beyond the financial statements are mandated, including:

[17] Regulation S-X is a SEC regulation that outlines how registrants should disclose financial statements on registration statements, periodic reports, and other filings.
[18] Regulation S-K is a SEC regulation that outlines how registrants should disclose material qualitative descriptors of their business on registration statements, periodic reports, and any other filings.
[19] Regulation S-T is a SEC regulation that outlines how registrants should disclose electronic filings and submissions of documents to the SEC.
[20] SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors

- Material Scope 1 and Scope 2 GHG emissions for large-accelerated filers and other accelerated filers that are not exempted (see definitions below)
- Governance and oversight of material climate-related risks
- The impact of climate risks on the company's strategy, business model, and outlook
- Risk management processes for material climate-related risks
- Material climate targets and goals

The objective of the SEC's final rules on climate disclosures is to enhance transparency and provide investors with consistent, comparable, and decision-useful information regarding climate-related risks and opportunities. The rules require registrants, including those undergoing initial public offerings (IPOs), to incorporate climate disclosures into their annual reports and registration statements starting from the year 2025[21], for calendar-year end large-accelerated filers. The objective is further reinforced by requiring registrants to include specific climate-related information in the footnotes of their financial statements. This includes details on the financial impacts of severe weather events and other natural conditions, as well as information on carbon offsets, renewable energy certificates (RECs), and material impacts on financial estimates and assumptions due to climate-related factors.

Scope

The compliance date under the final rules begins from 2025, phasing in for all registrants depending on the filer status. The below table summarizes the compliance dates under the final rules varying by the registrant type.

[21] At the time of writing this paper, the SEC has voluntarily stayed the rules' effective date pending judicial review. Depending on when the legal challenges are resolved, the mandatory compliance dates noted here may be retained or delayed.

Table 16
TRANSITION PROVISION TABLE OF SEC FINAL RULES

Compliance Dates under Final Rules				
Registrant Type	Financial Statement Disclosures and All Other Disclosures	Disclosures About Material Expenditures and Impacts	Scope 1 and Scope 2 GHG Emission Disclosures	Assurance on Scope 1 and Scope 2 GHG Emission Disclosures
Large Accelerated Filer	2025	2026	2026	Limited Assurance –2029 Reasonable Assurance- 2033
Accelerated Filer (excluding Smaller Reporting Companies, and Emerging Growth Companies)	2026	2027	2028	Limited Assurance –2031 Reasonable Assurance – Not Required
Nonaccelerated Filer, Smaller Reporting Companies, and Emerging Growth Companies	2027	2028	Not Required	Not Required

Definitions of the above terms:

- Large Accelerated Filer (LAF) (non-Smaller Reporting Companies) – a reporting company that has a public float of $700 million or more.
- Accelerated Filer (AF) (non-Smaller Reporting Companies) – a reporting company that has a public float of $250 million to less than $700 million, and annual revenues of $100 million or more[22].
- Smaller Reporting Companies (SRCs)– a reporting company that has a public float of less than $250 million, or a public float of under $700 million and less than $100 million in annual revenues[23].
- Emerging Growth Companies (EGCs) – a company that has completed an IPO in the last five fiscal years, and that has total annual gross revenues below $1.235 billion and has issued less than $1 billion in non-convertible debt in the past three years[24].

Standard Structure

[22] For the full definition, please refer to Accelerated Filer and Large Accelerated Filer Definitions https://www.sec.gov/corpfin/secg-accelerated-filer-and-large-accelerated-filer-definitions
[23] For the full definition, please refer to Smaller Reporting Companies https://www.sec.gov/resources-small-businesses/going-public/smaller-reporting-companies
[24] For the full definition, please refer to Emerging Growth Companies https://www.sec.gov/resources-small-businesses/going-public/emerging-growth-companies

The final rules are published in the form of a discussion paper[25], which outlines the proposed rules and final rules, with comments on the changes. The discussion covers the aspects below, of which some topics are comparable to the IFRS S2 four pillars.

- Disclosure of climate-related risks
- Disclosure regarding impacts of climate-related risks on strategy, business model and outlook
- Governance disclosure
- Risk Management disclosure
- Targets and goals disclosure
- GHG emission disclosure
- Attestation over GHG emissions disclosure
- Safe harbor for certain climate-related disclosures
- Financial statement effects
- Other requirements like registrants, structured data, and compliance date

2.1.2 GOVERNANCE

Similar to IFRS S2, governance disclosures regarding climate-related risks are primarily focused on both the board of directors' oversight and management's role. The final rules mandate registrants to disclose information about the specific board committees responsible for overseeing climate-related risks, the processes for disseminating information to these committees, and how they monitor progress towards climate-related targets or transition plans.

Notably, the disclosures of board of directors' oversight and any climate-related risks overseen are required regardless of materiality, underlining the expectation that matters overseen by the board are generally material. By contrast, disclosures about management's role in assessing and managing climate-related risks must be provided only if they apply to its oversight of material climate-related risks. Comparing this with the governance requirements outlined in the IFRS S2, while both frameworks emphasize both board of directors' oversight and management's role, IFRS S2 does not explicitly consider materiality in governance disclosure.

2.1.3 STRATEGY

SEC requires registrants to disclose any climate-related risks that have had or are reasonably likely to have a material effect on their business strategy, results of operations, or financial condition. These risks are categorized into physical risks, which are either acute or chronic, and transition risks that pertain to the potential shift to a lower carbon economy. The SEC requires detailed disclosure of these risks, including their nature, geographic location, impact on the registrant's operations, products or services, suppliers, purchasers, or counterparties to material contracts. Registrants are also required to disclose how these risks affect their strategy, financial planning, and capital allocation. If a registrant has a transition plan to manage climate transition risks, they should describe this plan and update its progress annually.

The SEC and ISSB both require entities to disclose information about their climate-related risks and opportunities, and how these affect their strategy, business model, financial performance, and position. However, there are some differences in their approaches. While the SEC focuses on the material effect of these risks on the business strategy, results of operations, or financial condition, IFRS S2 is more

[25] The Enhancement and Standardization of Climate-Related Disclosures for Investors https://www.sec.gov/files/rules/final/2024/33-11275.pdf

comprehensive, requiring entities to disclose information about their climate-related risks and opportunities, their effects on the entity's strategy and decision-making, and their impact on the entity's financial position, financial performance, and cash flows. IFRS S2 also emphasizes the need for entities to disclose the resilience of their strategy and business model to climate-related changes, developments, and uncertainties.

2.1.4 RISK MANAGEMENT

Both the SEC and ISSB guidelines on risk management emphasize the importance of identifying, assessing, and managing climate-related risks and opportunities. They both require entities to disclose their processes and policies in relation to these risks and opportunities. However, there are differences in their approaches and the level of detail they require. The SEC requires registrants to disclose how they evaluate and respond to material climate-related risks, and how these processes are integrated into their broader risk management program. The emphasis is on material risks, and the disclosure is more focused on the registrant's response to these risks. The IFRS S2, on the other hand, provides a more detailed and structured approach to risk management. It requires entities to disclose specific information about their processes and policies, including the inputs and parameters they use, how they use climate-related scenario analysis, how they assess the nature, likelihood, and magnitude of the risks, and how they prioritize and monitor these risks. It also requires entities to disclose how they identify and assess climate-related opportunities.

2.1.5 METRICS AND TARGETS

Under the SEC guidelines, companies are required to disclose their climate-related targets and goals if they materially affect or are reasonably likely to materially affect the business, results of operations, or financial condition. The disclosed information should include the scope of activities, how the target is measured, the time horizon for achieving the target, the baseline for tracking progress, the plans to achieve the targets, and annual updates on progress. If carbon offsets or renewable energy certificates (RECs) are a material component of the plan, additional information about them must be disclosed.

In comparison, the ISSB standards require entities to disclose targets set by the entity and any targets required by law or regulation to mitigate or adapt to climate-related risks or take advantage of climate-related opportunities. The ISSB guidelines provide more detailed requirements, including the metric used to set the target, the objective of the target, the part of the entity to which the target applies, the period over which the target applies, the base period for measuring progress, milestones, and interim targets, and whether the target is quantitative (absolute or intensity). The ISSB also emphasizes the use of cross-industry and industry-based metrics to monitor progress towards the targets.

The ISSB provides more comprehensive and specific requirements for the disclosure of targets, including the use of cross-industry and industry-based metrics. The SEC focuses on materiality and requires disclosure if targets materially affect the company, while the ISSB emphasizes the disclosure of targets to enable users to understand an entity's performance in relation to climate-related risks and opportunities. Notably, although the final rules do not require disclosure of Scope 3 GHG, if a registrant has established any targets or goals that are material and include Scope 3 GHG emissions, the registrant would be required to provide the disclosures outlined above with respect to such targets or goals.

2.1.6 CALIFORNIA CLIMATE DISCLOSURE BILLS

Beyond the SEC rules, an interesting development in the U.S. is the creation of state legislature to mandate climate risk-related disclosures. In October 2023, the State of California signed three groundbreaking

climate disclosure bills into law, the first state in the country to do so. This is significant because of California's size and the number of companies that operate in California. These three new laws, Assembly Bill 1305 (AB 1305), Senate Bill 253 (SB 253), and Senate Bill 261 (SB 261) have been codified into California's Health and Safety Code with each addressing different aspects of environmental transparency and corporate accountability. These laws build upon the California Global Warming Solutions Act of 2006, which already requires statewide greenhouse gas emissions reporting. The California Air Resources Board (CARB) is the main regulatory body responsible for overseeing these laws.

SB 253, also known as the Climate Corporate Data Accountability Act, requires companies with annual revenues over $1 billion that do business in California to disclose their greenhouse gas (GHG) emissions, covering Scope 1, 2, and 3 emissions, consistent with the methodology described by the GHG Protocol. Reporting for Scope 1 and 2 emissions begins in 2026, with Scope 3 emissions disclosures starting in 2027. The law also requires third-party assurance over emissions data and imposes an annual fee to support a Climate Accountability and Emissions Disclosure Fund, which is established by these laws.

CARB is responsible for creating the necessary regulations by 2025 and providing ongoing guidance to ensure accurate reporting. CARB will collaborate with a range of stakeholders, including the Attorney General, environmental advocates, and industry leaders, to create a robust reporting framework. Additionally, CARB will engage an emissions reporting organization to manage the collection and public dissemination of the reported data. By 2027, CARB must also commission an academic institution to prepare a comprehensive report on the disclosed emissions data, which will be made publicly accessible via a digital platform developed by the emissions reporting organization.

SB 261 requires companies with annual revenues over $500 million that do business in California to produce biennial reports describing their climate-related financial risks and adaptation and mitigation measures, beginning in 2026. These reports must align with the guidelines from the Task Force on Climate-related Financial Disclosures (TCFD) and be publicly accessible. CARB will determine an appropriate annual fee for implementing the law and may issue additional guidance to address any reporting gaps, ensuring comprehensive disclosure.

AB 1305 requires companies that market or sell voluntary carbon offsets to disclose comprehensive details about their offset projects, including the type of offsets, calculation methods for emissions reductions, and plans for handling any reversals or unfulfilled reductions. Companies claiming net-zero emissions must substantiate their claims with detailed information on their websites. CARB will regulate compliance and may issue further guidance to ensure clear and thorough disclosures.

Unlike the SEC's proposal, California's requirements extend to all companies with operations in the state, emphasizing comprehensive disclosure. Specifically, Senate Bill No. 261 (Greenhouse gases: climate-related financial risk) requires companies to disclose climate-related financial risks, covering both immediate and long-term impacts from physical and transition risks. While the exact alignment with TCFD recommendations remains uncertain, future regulations may clarify requirements, potentially including governance and metrics/targets alignment. Notably, California's framework mandates disclosure of Scope 1, 2, and 3 GHG emissions, irrespective of materiality, yet does not include mandatory disclosure of climate-related opportunities. The fact that Scope 3 GHG emissions are required is one of the most important distinctions between the California laws and the SEC rules, making the California law more comprehensive in this regard. It is also worth noting that other states might consider enacting their own legislation modeled after California's law, especially given the ongoing legal challenges facing the SEC's rules.

2.2 CANADA – B-15 CLIMATE RISK MANAGEMENT

2.2.1 INTRODUCTION

B-15 – Climate Risk Management is a regulatory guideline issued by Canada's Office of the Superintendent of Financial Institutions (OSFI) that directs how Federally Regulated Financial Institutions (FRFIs) assess, manage, and disclose climate-related risks. OSFI is a prudential regulator of FRFIs, responsible for ensuring their safety, soundness, and stability. The guideline, issued in March 2023, aims to help FRFIs build resilience in the face of climate-related physical and transition climate risks to ensure that FRFIs are better prepared to address and mitigate the potential financial impacts of climate change.

Scope

The mandatory disclosure requirements of B-15 will be implemented with various timelines for FRFIs, depending on the size and type of the financial institution. The Domestic Systemically Important Banks (D-SIBs) and Internationally Active Insurance Groups (IAIGs) headquartered in Canada must start reporting by fiscal year-end 2024, making their climate-related financial disclosures publicly available no later than 180 days after fiscal year-end. All other federally regulated banks and insurers must report one year later.

Standard Structure

OSFI has updated the B-15 minimum disclosure requirements to align with the IFRS S2 core contents – Governance, Strategy, Risk Management, and Metrics and Targets, including cross-industry metrics and industry-specific metrics, which will be determined at a later date. In contrast to the IFRS S2, however, where four pillars are defined, B-15 consolidates these requirements into two Chapters – Chapter 1: Governance and Risk Management Expectations, and Chapter 2: Climate-Related Financial Disclosures. The purpose of this is to minimize the additional work in fulfilling both requirements. While both frameworks encompass similar principles, B-15 distinguishes itself by streamlining the pillars into broader categories.

As a risk-based framework, OSFI has focused on the Risk Management and role of Governance in managing the risks. Under Governance, B-15 encompasses elements such as transition planning, a component addressed separately under the Strategy pillar in IFRS S2. Similarly, climate scenario analysis, which falls under the Strategy pillar in IFRS S2, is incorporated into the Risk Management pillar in B-15. The Guideline may soon include a separate chapter on Capital and Liquidity Adequacy, emphasizing the need for FRFIs to manage climate-related risks. FRFIs should integrate climate-related risks into their capital and liquidity adequacy processes, guided by OSFI's Own Risk and Solvency Assessment (ORSA) process[26].

The table below lists out the key principles of each category described in B-15.

[26] The Guideline E-19: Own Risk and Solvency Assessment (ORSA), by the Office of the Superintendent of Financial Institutions (OSFI), outlines how insurers should assess their own risks, capital needs, and solvency, and set their internal targets.

Table 17
PRINCIPLES OF B-15

B-15 Category	Principles
Governance	The FRFI should have the appropriate governance and accountability structure in place to manage climate-related risks. The FRFI should incorporate the implications of physical risks from climate change and the risks to the FRFI associated with the transition to a low-greenhouse gas (GHG) economy in its business model and strategy.
Risk Management	The FRFI should manage and mitigate climate-related risks in accordance with the FRFI's Risk Appetite Framework.
Climate Scenario Analysis and Stress Testing	The FRFI should use climate scenario analysis to assess the impact of climate-related risks on its risk profile, business strategy, and business model.
Capital and Liquidity Adequacy	The FRFI should maintain sufficient capital and liquidity buffers for its climate-related risks.
Climate-Related Financial Disclosures	OSFI's expectations for effective communication: • Relevant information • Specific and comprehensive information • Clear, balanced, and understandable information • Reliable and verifiable information • Appropriate for its size, nature, and complexity • Consistent over time

2.2.2 GOVERNANCE

The responsibility for governance falls primarily on Senior Management. In the case of foreign entities operating in Canada, this responsibility extends to Branch Management. The institutions are encouraged to consider the integration of climate-risk considerations into their compensation policies and practices. Understanding the impact of climate-related risks on both short-term and long-term strategic, capital, and financial plans is a crucial aspect of governance. These risks can affect FRFIs through both micro- and macro-economic transmission channels, necessitating a comprehensive understanding of their potential influence.

To effectively manage these risks, FRFIs are advised to develop and implement a Climate Transition Plan that aligns with their business strategy. This Plan should guide the institution's actions in managing the increasing climate-related physical and transition risks. The development of this Plan should involve an assessment of its achievability under various climate-related scenarios, along with a strategy for measuring and assessing progress against the Plan, such as using internal metrics and targets like GHG emissions. The Financial Stability Board's Task Force on Climate-Related Financial Disclosures provides additional guidance

on metrics, targets, and transition plans, which can be a valuable resource for FRFIs in their transition planning[27].

While both OSFI B-15 and IFRS S2 provide guidelines for governance related to climate-related risks and opportunities within financial institutions, there are notable differences in the level of granularity between the two frameworks. IFRS S2 offers more detailed and granular requirements for disclosure, outlining specific information that entities are required to provide regarding governance structures, responsibilities, and management's role in overseeing climate risks. In contrast, OSFI B-15 provides overarching principles and expectations for governance and accountability without specifying detailed disclosure requirements, such as the skills and competencies, delegation, and remuneration policies.

2.2.3 STRATEGY

B-15 does not have a separate section for strategy as in IFRS S2. Instead, strategy requirements are included only at a high level in the Governance and Risk Management chapter. Under Governance, OSFI set expectations of incorporating physical and transition risks into business model and strategy along with a Climate Transition Plan, which is mandatory under B-15. OSFI also includes a distinct sub-chapter discussing Climate Scenario Analysis and Stress Testing, which specifies that the scenario analysis should be used to assess the impact of climate-related risks on business strategy. In the Climate-related Financial Disclosure section, OSFI sets out the minimum mandatory disclosure of impacts of climate-related risks and opportunities in its business, strategy, and financial planning over short, medium, and long term, along with climate transition plan and climate resilience of its strategy.

Overall, B-15 is less granular than IFRS S2 under Strategy, particularly in the areas below.

- Business model and value chain: B-15 has fewer details around the current and anticipated effects of climate-related risks and opportunities on the entity's business model and value chain, and where in the entity's business model and value chain climate-related risks and opportunities are concentrated.
- Strategy and decision-making: B-15 requires disclosure of a climate-related transition plan aligned with business plan and strategy, but it does not require disclosure of the assumptions and dependencies on which the transition plan relies. At the time of the writing of this paper, the implementation date of the climate transition plan as minimum disclosure is still yet to be decided.
- Financial position, performance, and cash flows: B-15 does not explicitly require disclosure of current and anticipated effects of climate-related risks and opportunities on its financial position, financial performance, and cash flows for the reporting period.
- Climate resilience: OSFI B-15 requires FRFIs to understand the resilience of their business model and strategy, yet with less details on the development and model complexities when performing scenario analysis. At the time of writing this paper, the implementation date of climate resilience as minimum disclosure is still yet to be decided.

[27] The Corporate Governance Guideline by the Office of the Superintendent of Financial Institutions (OSFI) outlines the governance expectations for the Board of Directors and management of Federally Regulated Financial Institutions (FRFIs).

2.2.4 RISK MANAGEMENT

The guidelines highlight OSFI's expectation for FRFIs to incorporate climate-related risks into their risk management strategy, focusing on two main areas: (i) Risk Identification, Measurement, and Management and (ii) Risk Monitoring and Reporting.

Under Risk Identification, Measurement, and Management, FRFIs are expected to:

- Integrate climate-related risks into their Risk Appetite and Enterprise Risk Management (ERM) frameworks.
- Reflect these risks in their Internal Control Framework and relevant policies.
- Establish robust processes and controls to identify and measure both current and potential future impacts of climate-related risks.
- Use reliable, timely, and accurate data related to physical and transition risks.
- Implement relevant tools and models, including those used for climate scenario analysis, to measure and assess climate-related risks.

Under Risk Monitoring and Reporting, FRFIs are expected to:

- Integrate climate-related risks into their internal monitoring and reporting mechanisms. This involves monitoring and reporting on relevant internal metrics, limits, and indicators to evaluate the effectiveness of their climate risk management.
- Develop capabilities to aggregate climate risk data to identify and report on climate-related exposures, including risk concentrations.

Overall, OSFI B-15 is less granular than IFRS S2 under Risk Management, where B-15 places a strong emphasis on OSFI's expectations on risk management, climate scenario analysis, capital, and liquidity adequacy. In contrast, IFRS S2 assigns more detailed requirements around processes and policies related to risk management processes such as inputs, use of climate-related scenario analysis and processes related to assessing, prioritizing, and monitoring risks. IFRS S2 also requires disclosure of the processes and policies related to climate-related opportunities, which is of less importance under B-15.

2.2.5 METRICS AND TARGETS

OSFI B-15 requires GHG emissions disclosures of Scope 1, Scope 2, and Scope 3 on an absolute basis for the reporting period, along with the reporting standard used. The implementation priority is put on the largest banks and insurers, requiring disclosure of Scope 1 and 2 GHG emissions by 2024 and Scope 3 emissions by 2025. Under Scope 3 emissions, the investment emission (financed, facilitated, and insured) based on PCAF or other standards comparable with PCAF is also mandated. For targets, a description of the targets to manage climate-related risks and opportunities and the FRFI's performance against these targets is required, along with any public commitments, whether through an industry led Net-zero alliance or otherwise.

Overall, IFRS S2 outlines more detailed requirements, including the disaggregation of emissions and validation of targets by a third party. OSFI B-15, however, with consideration of implementation challenges, differentiates the metrics and target requirements based on the size and type of institutions, with specific timelines for compliance for each group. At the time of writing this paper, the details of cross-industry and industry-specific metrics, have yet to be decided by OSFI.

2.3 EUROPEAN UNION (EU) – EU SUSTAINABILITY REPORTING STANDARDS (ESRS)

2.3.1 INTRODUCTION

The European Commission (EC), as the executive branch of the European Union, is responsible for proposing legislation and implementing policies across member states. In 2021, the EC introduced the Corporate Sustainability Reporting Directive (CSRD), superseding the Non-Financial Reporting Directive (NFRD) from 2014 and marking the EU's initial effort to standardize ESG reporting. The CSRD serves primarily as a financial regulation aimed at enhancing transparency and consistency in corporate sustainability reporting, and it is overseen in each EU member state by national financial market regulators responsible for enforcing financial reporting standards. Member States were required to incorporate it into national legislation by June 2024, and certain companies must make this effective in 2024, to report in 2025. The CSRD expands the reporting obligations for sustainability information and broadens the scope outlined in the NFRD to more companies. To aid stakeholders in implementing the CSRD's provisions, the EC tasked the European Financial Reporting Advisory Group (EFRAG), a private association responsible for developing and endorsing financial reporting standards, with developing comprehensive and obligatory climate disclosure standards, also recognized as the European Sustainability Reporting Standards (ESRS).

The ESRS serves as a source of guidance for entities that are also applying the ISSB Standards. The interoperability guidance between ESRS and ISSB Standards explicitly mentions that entities applying ISSB can refer to and consider ESRS when preparing disclosures to meet ISSB requirements. This is particularly relevant where ISSB does not have specific standards or guidance for certain sustainability matters, making reporting by both standards more enhanced and detailed. To achieve a high degree of alignment between ISSB standards and ESRS, the EC and ISSB have worked closely to develop interoperability guidance, ensuring compliance and interoperability between the two standards[28]. An entity can comply with the climate requirements of both standards by following the interoperability guidance.

Scope

The ESRS, adopted by the EC in July 2023 and enacted as law on December 22, 2023, following publication in the official journal of the European Union, constitutes a comprehensive framework. The key objectives of ESRS are to standardize ESG reporting across companies, create a more transparent and comparable platform, and help stakeholders, investors, and consumers make more informed decisions. The ESRS was designed to apply to companies based in the EU, as well as multinational companies with significant operations or listings in the EU. The scope of ESRS includes:

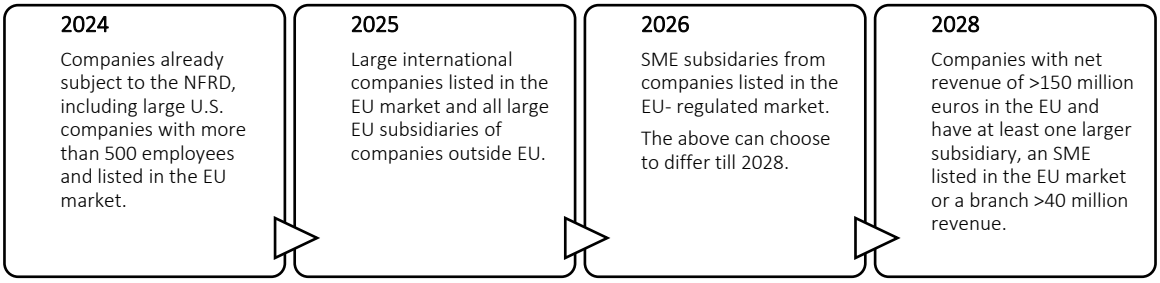
- All large companies, defined as companies that meet two of three criteria:
  - Revenues > EUR 50m
  - Total assets > EUR 25m
  - > 250 employees
- Global non-EU firms with revenue of €150m and at least one significant subsidiary or branch or a Small and Medium-sized Enterprise (SME)29 subsidiary listed in the EU market
- Subsidiaries of global non-EU undertakings are exempt from CSRD reporting obligations pursuant to the CSRD only when their nonfinancial information is included in a consolidated sustainability

[28] ESRS – ISSB Standards Interoperability Guide https://www.ifrs.org/content/dam/ifrs/supporting-implementation/issb-standards/esrs-issb-standards-interoperability-guidance.pdf

[29] Listed SMEs are eligible if they meet at least two of these criteria: (1) Average number of employees <50, (2) Balance sheet <EUR 5m, (3) Revenue < EUR 10m

report and the report has been prepared in accordance with the EU sustainability reporting standard

The Standards will be applied and reported in four stages as shown below.



Standard Structure

Similar to GRI, ESRS has a bottom-up structure, which consists of various topics that are deemed to be material to the users, while ISSB has a top-down structure which covers sustainability and climate from a principle-based perspective. The standards framework comprises 12 ESRS standards, covering a broad spectrum of sustainability concerns outlined in the CSRD. The 12 standards consist of two cross-cutting standards (general requirements and general disclosures) and ten topical standards[30] (covering environment, social, and governance) addressing specific ESG issues, applicable across sectors. Each standard describes its own disclosure obligations and data requirements. In progress is also the development of ESRS Sector Standards (SET 2), which describe disclosure requirements that are specific to various sectors such as textiles, mining, road transportation, food and beverage, energy production, and utilities. These Sector Standards are expected to be adopted by June 2026. Several disclosures in the standards that were originally mandatory were subsequently made voluntary[31].

The two cross cutting standards and the ten topical standards include:

- ESRS 1 General Requirements
  - Similar to IFRS S1, ESRS 1 outlines the principles used in the preparation of these requirements, the fundamental concepts used, and the general requirements for preparing and presenting sustainability reporting under the CSRD, along with unique features such as double materiality and the distinction between sustainability reporting and management reporting.
- ESRS 2 General Disclosures
  Defines how an undertaking discloses and reports on its policies, actions, metrics, and targets, along with reporting on an analogous set of four pillars - Governance (GOV), Strategy and Business Model (SBM), Impact, Risk, and Opportunity Management (IRO), and Metrics and Targets (MT).
- Topical Standards
  - Defines requirements for specific ESG topics
    - Environmental: climate change, pollution, water, biodiversity, resource use
    - Social: workforce, employees, communities, and consumers

[30] The first set of ESRS - the journey from PTF to delegated act (adopted on 31 July 2023) - EFRAG
[31] List of disclosures made voluntary can be found on pages 7-10 CSRD (efrag.org)

- Governance: business conduct

All companies must comply with the general requirements of ESRS 1 and the general disclosure requirements of ESRS 2 regardless of materiality, for the most part. Subsequently, companies are tasked with conducting a materiality evaluation for the ten topical standards to identify those pertinent to their operations. If a standard is deemed material, the company must fulfill its disclosure obligations accordingly.

Unlike “single materiality” in ISSB standards, materiality is defined as "double materiality," a distinctive feature of the ESRS standards, which refers to financial materiality or impact materiality, or both in the reporting process. Under ESRS E1, entities are required to report not only on how climate-related issues may affect their financial performance and position (financial materiality), but also on how their operations and practices impact the climate and broader environmental goals (impact materiality).

The ESRS E1 standard also includes specific requirements regarding assurance, reflecting the broader push for reliable and verifiable sustainability reporting in Europe. Assurance in this context refers to the evaluation of the processes, controls, and reported information by an independent third party to confirm its accuracy and adherence to the reported standards. Under ESRS E1, it is mandatory to cover both the accuracy of data and the application of the reporting criteria defined in the standards, at a reasonable level, akin to the assurance level obtained for financial audits. The assurance must cover all quantitative and qualitative aspects of sustainability reporting, ensuring that disclosures are not only accurate, but also appropriately reflect the company’s impact and management of sustainability issues, including climate-related risks and opportunities.

The ISSB’s approach to assurance is less prescriptive compared to ESRS. While ISSB recognizes the importance of assurance for enhancing the credibility of sustainability disclosures, it currently does not mandate assurance. Instead, it leaves the decision to seek assurance up to the individual companies, based on their specific circumstances and the expectations of their stakeholders.

2.3.2 GOVERNANCE

The ESRS 2 standard specifies the following disclosure requirements for Governance (GOV 1-5):

- Composition and roles and responsibilities of administrative, management, and supervisory bodies
- How the governance bodies are informed about pertinent ESG matters
- Integration of an undertaking’s sustainability-related performance into incentive schemes and remuneration policies of the administrative, management, and supervisory bodies
- Mapping of information provided in its sustainability statement about the due diligence process regarding sustainability matters[32]
- Risk management and internal control system related to the sustainability reporting process

For Climate Change (ESRS E-1), disclosures under this pillar involve the roles and responsibilities, and leadership and accountability of the board and senior management in assessing and managing climate-related risks and opportunities. It also involves how climate change is integrated into the organizational governance structure and which committees or executives have oversight over climate-related issues.

[32] The due diligence process is the ongoing process by which a company identifies and assesses material negative impacts and documents the means by which it mitigates these negative impacts.

Governance structures related to climate-related risks and opportunities are covered similarly by both ISSB and ESRS standards, emphasizing the roles of senior management and the board. However, ESRS requires more details on disclosures related to details on incentive schemes, the composition and diversity of governance bodies, due diligence of sustainability matters, risk management, and internal controls over sustainability reporting.

2.3.3 STRATEGY

The ESRS 2 standard specifies the following disclosure requirements for Strategy and Business Model (SBM 1-3):

- Elements of an undertaking's strategy that relate to ESG topics, its business model and value chain.
- How the interests and views of the undertaking's stakeholders are considered by its strategy and business model.
- Material impacts, risks and opportunities, and their interaction with strategy and the business model. The material impacts cover the material negative and positive impacts on people and environment, and the current and anticipated financial effects of the undertaking's financial statements.

For Climate Change (ESRS E-1), this pillar requires organizations to disclose how climate change is integrated into the company's overall business strategy, including potential impacts on the business model, products, and services over the short, medium, and long term, along with a transition plan for climate change mitigation. Another important part of this pillar includes the use of climate-related scenario analysis to assess potential future states and their impacts on the business, helping to inform strategic planning and risk management.

ESRS requires additional detail, as compared to ISSB. In particular:

- ESRS requires much more detail on disclosing progress toward the implementation of a transition plan, the funding and investment allocation of the plan, how the plan is aligned with global warming targets, and its strategy and business model. If there is no such plan, ESRS also requires disclosing when or whether a transition plan will be adopted.
- ESRS requires disclosing how strategy might be impacted due to climate risks and opportunities and demands a more comprehensive outline about how an undertaking plans to achieve its strategic goals in the context of climate change.
- ESRS requires structured disclosures on material impacts with their descriptions and the role and involvement of affected stakeholders – both of which ISSB does not explicitly require.

Scenario Analysis

Under the Strategy and Business Model Pillar, ESRS 2 requires a description of the resilience of the undertaking's strategy and business models to climate change, including the scope and use of scenario analysis and its results. In the ESRS E1 – standard, with reference to the TCFD guidance on scenario analysis[33], disclosure requirements are specified, including:

- Use of scenario analysis – how the undertaking has used scenario analysis to inform the identification and assessment of physical and transition risks and opportunities over the short-, medium-, and long-time horizon.
- Inputs and key assumptions – whether and how the identification of climate-related hazards is informed by high emissions climate scenarios. The disclosure of key forces, drivers, inputs, and constraints of the scenarios are also required.
- Scenarios – a diverse range of scenarios, including at least a scenario in line with limited global warming to 1.5°C, to detect relevant environmental, societal, technology, market and policy-related developments and determine its decarbonization levers.

With respect to the use of climate scenarios, IFRS S2 specifically focuses on investor needs, financial impacts, and how different climate-related scenarios could affect the financial health of the company. While ESRS covers financial impacts, it also focuses on environmental and social impacts due to its double materiality requirement. ESRS is designed to meet the needs of a wider range of stakeholders, including regulators, customers, and the public, reflecting the EU's comprehensive approach to sustainability. Therefore, ESRS scenario analysis might address broader impacts, such as the company's contribution to national and EU climate goals, its social license to operate, and its overall environmental footprint.

Scenario analysis in IFRS S2 is more quantitatively oriented, often involving detailed financial modeling depending on resources and skills. Companies are expected to disclose the assumptions used in their scenarios, the financial implications of these scenarios, and how these implications are integrated into the company's financial planning and risk management processes. ESRS E1 also demands a rigorous approach to scenario analysis but places more emphasis on qualitative outcomes and the integration of climate risks into the company's overall sustainability strategy. This might include looking at opportunities for innovation in green technologies or changes in operational practices to enhance resilience.

2.3.4 RISK MANAGEMENT

The ESRS 2 standard specifies the following disclosure requirements for Impact, Risk and Opportunity Management (IRO-1 and 2):

- Description of the undertaking's process to identify impacts, risks, and opportunities and assess material resource use and circular economy-related impacts, risks, and opportunities are material
- Listing of the Disclosure Requirements complied with in preparing the sustainability reporting, following the outcome of the materiality assessment

[33] The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities
https://assets.bbhub.io/company/sites/60/2020/10/FINAL-TCFD-Technical-Supplement-062917.pdf

For Climate Change (ESRS E-1), this pillar requires the undertaking to disclose:

- The undertaking's policies adopted to manage its material impacts, risks, and opportunities related to climate change mitigation and adaptation.
- Climate change mitigation and adaptation actions and the resources allocated for their implementation.

The need to disclose how climate-related risks are identified, assessed, and managed is common to ISSB and ESRS. ESRS is more detailed and comprehensive with regard to the processes, outcomes, and how the practices integrate into the overall risk management framework. This is accomplished by requiring a description of methodologies, assumptions, decision-making processes, related internal control procedures, as well as timing of modifications/improvements to the processes and future revision dates of the materiality assessment.

Another notable requirement is the ESRS IRO 2, which specifies the disclosures about how the undertaking assesses the likelihood, magnitude, and nature of the effects of the identified risks and opportunities, and how the undertaking prioritizes sustainability-related risks relative to other types of risks, including its use of risk-assessment tools. These requirements are not mandated by IFRS S2.

2.3.5 METRICS AND TARGETS

ESRS 2 has specified minimum disclosure requirements when an undertaking discloses its metrics and targets related to each material sustainability matter, alongside disclosures by the topical ESRS standards. The key minimum disclosure requirements are categorized by ESRS into the Metrics and Targets below:

- Minimum disclosure requirement for Metrics (MDR-M) - focusing on how the undertaking uses the metrics to track the effectiveness of its actions to manage the material sustainability matters:
  - Methodologies and significant assumptions, including limitations
  - Whether metrics are validated by an external body
  - Label and define the metrics, along with presentation currency
- Minimum disclosure requirement for Targets (MDR-T) - focusing on how the undertaking tracks the effectiveness of policies and actions through targets regarding each material sustainability matter:
  - Targets may be specified in terms of the effects on human rights, welfare, or positive outcomes for affected stakeholders
  - Progress towards achieving the targets
  - Where the undertaking describes progress in achieving the objectives of a policy in the absence of a measurable target, it may specify a baseline against which the progress is considered

The different topical standards each have their own specific metrics and targets. Climate Change (ESRS E-1) requires the undertaking to disclose:

- Climate-related targets set by the undertaking
- The energy consumption and mix of energy sources
- Gross Scope 1, 2, 3 and total GHG emissions
- Greenhouse gas removals and storage
- Whether the undertaking applies internal carbon pricing schemes

- Anticipated financial effects from material physical risks and transition risks and the potential to benefit from material climate-related opportunities.

Both ISSB and ESRS standards emphasize the importance of metrics and targets in managing climate-related risks and opportunities, with key differences identified in the areas below.

- GHG emissions metrics – IFRS S2 requires disaggregation of Scope 1 and Scope 2 GHG emissions between consolidated accounting groups and other investees, but this requirement is not in ESRS. Financed emissions required under IFRS S2 are also not specified in ESRS, but this requirement could be added with further ESRS sector-specific standard development in the future.
- Internal carbon pricing scheme – this disclosure of scheme type and detailed scope is not specified under IFRS S2.
- Carbon credit – IFRS S2 does not require disclosure of carbon credits purchased from outside the value chain and cancelled in the reporting period, nor GHG removals and mitigation projects financed through carbon credits.

2.3.6 REGULATORY DEVELOPMENT IN THE UNITED KINGDOM (UK)

Although separate from the CSRD, the UK's climate disclosure regulatory regime is well-developed and merits some discussion. In January 2022, the UK Government introduced mandatory climate-related financial disclosure requirements through the Companies (Strategic Report) (Climate-related Financial Disclosure) Regulations 2022[34] and the Limited Liability Partnerships (Climate-related Financial Disclosure) Regulations 2022[35]. These regulations are part of the UK Government's broader effort to align with the Task Force on Climate-related Financial Disclosures (TCFD) recommendations. The purpose of these laws is to enhance transparency and enable investors and stakeholders to understand how companies are managing climate-related risks and opportunities.

These regulations stem from the UK Government's 2019 Green Finance Strategy, which set the expectation that, by 2022, disclosures from all listed companies and major asset owners should align with TCFD standards. Under these regulations, premium-listed companies, as well as standard-listed issuers, asset managers, life insurers, and Financial Conduct Authority (FCA)-regulated pension providers, are required to provide climate-related disclosures. The FCA, which regulates the conduct of financial services firms, is responsible for enforcing climate-related financial disclosure requirements for financial institutions and insurance companies, ensuring that these entities adhere to transparency and reporting standards. The Prudential Regulation Authority (PRA), which regulates the stability and soundness of financial institutions, is responsible for overseeing the prudential management of climate-related risks, focusing on how these risks are integrated into the overall financial stability and risk management frameworks of regulated firms.

UK companies required to produce a non-financial information statement include those with more than 500 employees and have either transferable securities admitted to trading on a UK-regulated market or are classified as banking or insurance companies. These companies must report on non-financial matters at

[34] The Companies (Strategic Report) (Climate-related Financial Disclosure) Regulations 2022
https://www.legislation.gov.uk/uksi/2022/31/contents/made
[35] The Limited Liability Partnerships (Climate-related Financial Disclosure) Regulations 2022
https://www.legislation.gov.uk/uksi/2022/46/contents/made

either the group level or the company, depending on their structure and whether they fall within the scope of the regulations.

Since the introduction of the ISSB standards, the UK government has laid plans to establish a framework to assess the appropriateness of IFRS S1 and IFRS S2 for endorsement in the UK, along with the development of the first two UK Sustainability Disclosure Standards (SDS). The UK government aims to make these UK-endorsed ISSB standards available by 2025[36].

2.4 RESPONSES OF THE ASIA PACIFIC REGION TO THE ISSB STANDARDS

The Asia Pacific region, comprising a diverse set of economies, has shown a mixed but overall positive response to the new ISSB standards. The region's responses reflect its commitment to sustainability and the recognition of the role of the ISSB standards in achieving this goal. Overall, the Asia Pacific region has started to develop exposure drafts on climate-related financial disclosures aligning with the new ISSB standards. For most of the region, the adoption of IFRS S1 and IFRS S2 will start between 2024 and 2025.

As described in the summary below, the response to the new ISSB standards varies across countries. Some countries have expressed concerns about implementation challenges. Regions with lower adoption rates of sustainability standards like TCFD/GRI/SASB have shown less progress towards the adoption of the new ISSB standards. Operational challenges have led to different focuses across the region, reflecting varying priorities towards sustainability. For example, South Korea and Japan are considering giving issuers more time to comply, while Australia and Hong Kong are initially concentrating more narrowly on climate-related disclosures rather than broader sustainability issues.

[36] Sustainability Disclosure Requirements: Implementation Update 2024
https://assets.publishing.service.gov.uk/media/66446f5eae748c43d3793b32/20240502_Cleared_FINAL_SDR_Imp_Update_doc.pdf

Table 18
SUSTAINABILITY-RELATED DISCLOSURE DEVELOPMENT OF SELECTED ASIA-PACIFIC JURISDICTIONS

Jurisdiction	ISSB Standard Adoption Plan	Focus
Australia	The exposure draft of climate-related financial disclosure guidance was released in October 2023. A staged implementation has been scheduled from 2024 to 2027, with large corporations adopting sooner, followed by smaller entities. [37]	Climate
China	The IFRS foundation established a Beijing office in 2023, to execute the ISSB's strategy for emerging and developing economies[38]. Major Chinese stock exchanges published a draft guideline on sustainability disclosure in February 2024[39].	Sustainability
Hong Kong	The Stock Exchange of Hong Kong Limited is finalizing rules for ISSB adoption, focusing on climate-related financial disclosure, with a proposed implementation date in January 2025.[40]	Climate
Japan	The ISSB and the Sustainability Standards Board of Japan have been working closely since 2023. An exposure draft of sustainability disclosures, incorporating IFRS S1 and IFRS S2 requirements, was released in 2024 and will be finalized by 2025.[41]	Sustainability
Singapore	The Singapore Exchange Regulation is suggesting amendments to its listing rules and Sustainability Reporting Guide to include more comprehensive climate-related disclosures. From 2025, listed issuers will be required to reference IFRS S1 and IFRS S2 when preparing climate-related financial disclosures.[42]	Sustainability
South Korea	An exposure draft proposing sustainability disclosures based on IFRS S1 and IFRS S2 was published in May 2024, along with additional country-specific alignment standards. The timeline within the legal framework is still being discussed.[43]	Sustainability

2.5 TAKEAWAYS

The sustainability and climate regulations of individual countries implement ISSB standards into region-specific guidelines. Associated regulatory bodies can also enforce these regulations by conducting

[37] Australian Sustainability Reporting Standards – Disclosure of Climate-related Financial Information https://www.aasb.gov.au/admin/file/content105/c9/AASBED_SR1_10-23.pdf
[38] IFRS - IFRS Foundation and MoF China sign an MoU to establish an ISSB office in Beijing
[39] Major Chinese stock exchanges publish draft guidelines for sustainability reporting https://www.iasplus.com/en/news/2024/02/china-sustainability
[40] Update on Consultation on Enhancement of Climate Disclosures under ESG Framework (hkex.com.hk)
[41] Progress towards adoption of ISSB Standards as jurisdictions consult
[42] Consultation Paper on Sustainability Reporting: Enhancing Consistency and Comparability https://regco.sgx.com/regco/public-consultations/20240307-consultation-paper-sustainability-reporting-enhancing
[43] Korea consults on sustainability disclosure standards based on the ISSB standards https://www.iasplus.com/en/news/2024/may/korea-sustainability-ed

assurance to ensure companies are complying with the standards, and by imposing penalties for non-compliance. The above discussed regulations in the U.S., Canada, and the EU have different enforcement approaches, yet all with a common goal of implementing climate risk management and disclosure standards.

Section 3: Actuarial Involvement

3.1 FUTURE OF ACTUARIES IN CLIMATE

As professionals skilled in managing insurance and financial risks, actuaries are uniquely positioned to contribute to climate risk management in the insurance and finance sectors. Their expertise in creating complex models, as well as their knowledge of insurance products, enables them to predict potential outcomes and develop strategic plans for mitigating climate risk. This section explores the specific roles actuaries can play in addressing climate risk within the context of the four pillars of the ISSB standards.

3.1.1 GOVERNANCE

Actuaries can play a pivotal role in the governance of climate-related risks and opportunities, by leveraging their expertise in risk management and insurance to enhance organizational resilience and strategic planning. Within insurance companies, actuaries regularly work in the risk function, where climate risk management is also likely to reside, so actuaries could work in the identification, management, and/or reporting of climate risks and opportunities, performing roles analogous to those they perform today in other risk contexts.

The following describes possible actuarial roles in climate risk governance from a Three Lines of Defense Model[44] perspective:

- First line roles would involve the identification and management of climate risks. Actuarial involvement could include the development and execution of climate policies, procedures, and controls to manage climate risks, including the incorporation of climate risk into the overall risk management framework, as well as related operations such as pricing and underwriting. For example, risk-adjusted return measures and sensitivity tests for pricing purposes would need to incorporate climate risk considerations. First line roles could also include fulfilling periodic climate disclosure regulatory filings required by regulators or reporting on the actual and expected impacts of climate change on business models and financials. This would potentially require analyzing data to understand the impact on insurance assets and liabilities from climate-related events, such as extreme weather, and assessing long-term trends in mortality and morbidity related to climate change. This type of impact analysis is a recurring theme with respect to climate risk management and is one of the key areas in which actuaries will increasingly contribute to as climate risk management continues to develop in the financial institutions.
- Second line roles would involve ensuring that climate risks are effectively managed and overseeing the activities of the first line of defense. Actuaries in this function, such as those already commonly in the role of Chief Risk Officer (CRO), might not only have direct oversight of managing climate risk, but might also have responsibility for developing climate risk policies and procedures. This could include defining climate-related scenarios and stress testing levels, assessing climate risk through an Own Risk and Solvency Assessment (ORSA) process, or setting risk limits for climate transition and physical risk impacts on asset and liability portfolios. Besides CRO, other actuaries in the risk function could assume the role of "climate risk actuary," specializing, for example, in impact analysis on either assets or liabilities or providing other various quantitative or

[44] The IIA's Three Lines Model – An Update of the Three Lines of Defense https://www.theiia.org/globalassets/documents/resources/the-iias-three-lines-model-an-update-of-the-three-lines-of-defense-july-2020/three-lines-model-updated-english.pdf

qualitative specialist expertise. At the time of the writing of this paper, such roles had already been observed in some insurance companies. This is only expected to proliferate.

- Third line roles would involve providing independent assurance to the board and senior management that first and second line operations are consistent with expectations. Actuaries already work within internal audits related to actuarial risk and controls and could also be involved in auditing the processes and controls related to climate risk management, evaluating the effectiveness of climate risk governance frameworks, providing recommendations for improvements, and reporting findings.

Actuaries also often sit on boards of insurance companies and would be involved in overseeing and approving climate risk policies and procedures, risk limits, metrics, and targets, or taking part in climate-related strategic decision-making. Actuaries already perform similar roles with respect to the management of insurance and market risks.

3.1.2 STRATEGY

Climate-related Risks and Opportunities

Actuaries can play an important role in identifying and articulating climate-related risks and opportunities within the insurance and financial sectors. For example, actuaries are well-suited to research climate-related opportunities such as new, innovative insurance products tailored to emerging climate risks or other green insurance products such as those that incentivize environmentally friendly practices. Actuaries can also assess the climate-related risks and opportunities of existing insurance portfolios. From a physical risk perspective, actuaries can perform analysis to determine which insurance products in which regions could benefit from or suffer from changing climate variables. They can also help identify potential impacts on physical real estate and real estate-related assets. From a transition risk perspective, actuaries can help identify asset portfolios that could be vulnerable to changes in value in the future. These concepts are discussed further below.

Effect on Business Model and Value Chain

Once climate-related risks and opportunities have been identified, actuaries can use this information to extrapolate the impacts on the business model and value chain of the company. This might include assessing underwriting practices for weaknesses due to climate risk factors. This could also include assessing claims management processes in the same way. For example, with the increasing frequency and severity of wildfires in North America, access to real-time data is becoming increasingly advantageous during and immediately after an event occurs. Insurers and reinsurers are already increasingly using real-time satellite data as a part of the claims management process to assess natural disaster-related damage or crop yield levels (in the case of crop insurance). Machine learning can be applied to this same data to incorporate future climate impacts and improve predictability. Actuaries could also assess reinsurance strategies and structures to identify the potential impacts of climate-related risks and opportunities on reinsurance programs.

Effect on Strategy and Decision-making

There are many ways actuaries can contribute to assessing and documenting the impacts of climate-related risks and opportunities on strategy and decision-making. One such way is through the adaptation of insurance products. As mentioned above, actuaries can and already are developing climate-related insurance products and reinsurance programs. This includes:

- Parametric insurance, where the insurance pays out based on the occurrence of predefined events (e.g., a certain level of rainfall or wind speed, rather than on the actual loss incurred).
- Weather insurance, where insurance products are used to bridge the gap left by traditional insurance policies. For example, the Weather Insurance Agency[45] offers various types of coverage that eliminate the financial risk when planning a special event that can be impacted by weather.
- Insurance for renewable projects, where insurers and reinsurers offer renewable energy insurance for solar, wind, and hydro power construction, and sustainable energy-related property and casualty insurance.
- Investment products with low GHG investment fund options, where insurers offer carbon neutral funds to reduce the financed emissions and achieve zero emissions after carbon offsetting.
- Agricultural insurance, which offers coverage to help farmers avoid financial losses from poor crop yields due to extreme events such as flooding and droughts. Insurers that offer these types of products increasingly need to incorporate the current and future impacts of climate change.
- Traditional insurance products with "green features," such as lower premiums for properties that meet certain sustainability criteria or for companies that demonstrate reduced carbon footprints.
- Changes to existing insurance products, such as repricing or changing sales volumes to address the climate-related risk or opportunity. In the future, pricing and/or sales volumes could be affected by the Scope 3 emissions of the insured party. As mentioned earlier, PCAF has already developed a methodology for measuring Scope 3 emissions from the underwriting of certain P&C coverages. This could extend to life coverages in the future as well.

Another effect on the business model of a financial institution involving the actuary is the adaptation of assets and investment strategies to climate-related risks and opportunities. Financial institutions are invested in a wide range of assets varying by region and industry, and a common focus of the climate transition plan is to assess the impacts of exposure to both high and low GHG industries. Actuaries commonly work in investments and could likely be involved in this process. One aspect of this process would be sector selection. Actuaries could support the analysis by comparing returns from a given asset/sector to some measure of GHG intensity for the asset or sector. This might be based on Scope 3 emissions, on third party data, or some other estimation technique. Various asset mixes would need to be tested to ensure that these climate-adjusted mixes not only meet investment risk constraints and return objectives, but also meet any Scope 3 emissions commitments made in the climate transition plan. As an additional consideration, regulatory capital rules in each jurisdiction could also evolve in the future to incorporate physical and transition risk factors applicable to assets, adding another constraint to the asset selection process. Also, actuaries would usually be involved in the modeling of these asset cash flows, which would be required in any number of exercises, such as asset adequacy testing, asset-liability matching, sensitivity and stress testing, etc.

For life and pension actuaries, a factor that could affect the business model of a financial institution, at least indirectly, is the impact of physical climate risk on mortality and morbidity. Actuaries should play a key role in evaluating the impacts of physical climate risks and opportunities on mortality and morbidity, with a focus on both chronic and acute effects. Chronic climate impacts involve gradual changes, such as rising temperatures and changing precipitation patterns. Acute impacts refer to sudden, severe events such as heatwaves, floods, and storms, which can cause immediate emergencies.

[45] Weather Insurance Agency https://weatherins.com/weather-insurance/

Primary impacts of climate include direct effects like heat stress, which can directly impact mortality rates, especially among vulnerable groups like the elderly. Heatwaves can exacerbate cardiovascular and respiratory conditions, leading to spikes in hospital admissions and fatalities. Additionally, increased temperatures can directly impact workers in outdoor environments, causing heat-related illnesses and reducing labor productivity. Secondary impacts are the indirect consequences of climate change. For instance, malnutrition and starvation can result from decreased food security as agricultural yields are affected by changing weather patterns and more frequent extreme weather events. Droughts can lead to water shortages, affecting sanitation and increasing the spread of waterborne diseases like cholera. Flooding can disrupt communities, damage infrastructure, and lead to outbreaks of diseases.

Some impacts of climate change on mortality and morbidity would likely be easier to quantify than others, depending on the availability of relevant data. For example, specific climate-related causes of death, such as heat stress, are already collected in datasets from national health departments and can be combined with historical climate databases to assess correlations between climate change and mortality. Once these relationships are quantified, climate variables, such as maximum temperatures or several extreme heat days, can be projected and used to understand the impact on relevant insurance or pension portfolios. Similarly, actuaries can contribute to researching and analyzing the potential rise in diseases spread by vectors that thrive in warmer climates, such as the expansion of Lyme disease, Malaria, etc.

Other, more advanced analyses might include evaluating the effects of climate-induced food insecurity on health. Climate change can disrupt food production, leading to shortages and higher prices, which can result in malnutrition, particularly in low-income regions. They can also examine how changing precipitation patterns affect water supply and sanitation, potentially leading to increased disease transmission. These types of analyses are more complex and could necessitate additional data, as well as collaboration with other disciplines such as economists and climate scientists.

Effect on Financials

The quantification and qualification of the effect of climate-related risks and opportunities on a company's financials is complex and multi-faceted. It involves assessing the impacts over varying timeframes on financial statement items such as:

- Revenue – including sales volumes, prices, and market demand for products or services
- Expenses – including operating costs, energy, equipment, human resources, and compliance costs
- Assets – including the impairment or revaluation of assets due to climate-related risks (e.g., property damage, stranded assets)
- Liabilities – including potential changes in insurance premiums, liabilities, and capital
- Capital Expenditure – including required investments in new technologies, infrastructure, or processes to mitigate risks or capitalize on opportunities

With respect to the quantification of impacts to the financials, actuaries would have a clear role to play, although there currently aren't any generally accepted approaches for doing this type of financial impact analysis. One possible approach would be to use historical climate variables to derive relationships with historical financial statement data, similar to how actuarial experience studies are performed. Climate scenarios of some kind that project these same climate variables into the future would then be needed. Climate scenarios are discussed further below. Quantification of financial impacts could then be performed through some form of modeling. These models might connect the projections of climate variables with the derived dependencies to arrive at financial impacts. Actuaries are very well suited to derive these dependencies and create these models, drawing on their quantitative skills and data and modeling expertise. It is important to note that climate modeling is generally beyond the scope of the actuarial

skillset and that actuaries should consider themselves as users of the outputs of these models, relying on other professionals with expertise in these models to perform the modeling. In some companies, it has been observed that actuaries are beginning to collaborate with climate science professionals, for example.

Climate Resilience

In the context of IFRS S2 and other climate disclosure standards, one of the core aspects of climate resilience is climate stress testing and scenario analysis. This is one of the areas of greatest relevance to actuaries. Over the past decade, different global actuarial associations have already published various practical guidance on climate scenario analysis, such as *Introduction to Climate-related Scenarios*[46] by the International Actuarial Association (IAA) and *A Practical Guide to Climate Change for Life Actuaries/General Insurance Actuaries/Investment Actuaries*[47] by the Institute and Faculty of Actuaries (IFoA), and the expectation is that actuaries will play a key role in performing climate stress testing and scenario analysis.

Climate scenario analysis involves creating and analyzing a range of plausible future climate scenarios to understand the implications on a company's operations or financial position over various time horizons. While parameterizing the scenarios into assumptions is challenging, insurance regulators have started to develop climate scenarios and associated stress factors for use by the regulated companies. One such exercise in Canada in 2024 is OSFI's Standardized Climate Scenario Exercise (SCSE), which focuses on the impacts on credit risk and market risk under prescribed climate-related transition scenarios, as well as an assessment of real-estate assets and liabilities exposed to physical risks like floods and wildfire. Similarly, in the UK, the Bank of England's Biennial Exploratory Scenario (BES) assesses the resilience of the UK financial system to climate-related risks, including both transition and physical risks, requiring financial institutions to evaluate the impacts of different climate scenarios on their operations and financial positions. In these mandatory exercises, actuaries are already playing a major role in preparing the asset and insurance-related data and calculating the impacts.

In these mandatory stress-testing exercises, much of the methodology is provided by the regulator due, in part, to the nascency of climate scenario modeling within financial institutions. However, in the future, regulators could require the development of a company's own internal scenario analysis methodology. The development of climate models and scenarios is typically beyond the scope of traditional actuarial knowledge. As such, actuaries might consider adopting widely available scenarios, such as Network for Greening the Financial System (NGFS)[48] and Coupled Model Intercomparison Project (CMIP)[49] scenarios. These are currently used within financial institutions and other industries as well but come with some limitations. These publicly available scenarios are the outputs of extremely large and complex models called Integrated Assessment Models (IAMs) in the case of NGFS, and Earth System Models (ESMs) in the case of CMIP and require specialized economics and climate science knowledge to interpret the code and assumptions and validate the results. Actuaries may, therefore, need to collaborate with other professionals to develop appropriate climate scenarios. In addition, these scenarios are developed for research and policy-making purposes, and not designed specifically for use in risk management. For example, these scenarios are based on "what-if" narratives rather than calibrated distributions. Therefore,

[46] Introduction to Climate-related Scenarios https://www.actuaries.org/IAA/Documents/CMTE_EXEC/ClimateRisk_TF/Webinars/Webinar_Intro_to_Climate-related_Scenarios_17March2021_Final.pdf

[47] A Practical Guide to Climate Change for Life Actuaries https://www.actuaries.org.uk/practice-areas/sustainability/research-working-parties/practical-guide-climate-change-life-actuaries

[48] NGFS Scenario Portal https://www.ngfs.net/ngfs-scenarios-portal/

[49] CMIP https://wcrp-cmip.org/

it is difficult to understand the severity of a given scenario on a percentile basis, and only qualitative descriptions of the severity are provided. Lastly, the scenario data do not provide directly usable information, for example shocks to bonds or mortality. These need to be derived from more basic information provided in the scenario output, like projections of climate variables or macroeconomic indicators, and actuaries will need to perform additional modeling to achieve this as described earlier. As can be seen, financial institutions will need to develop additional expertise in the future to fulfill the growing need for climate scenario modeling.

As a final consideration, catastrophe (CAT) models are widely used in the insurance industry. Traditional CAT models capture the natural volatility of weather and are capable of measuring tail risk by using historical data. The results obtained from catastrophe models are extensively used in determining insurance rates, quantifying premium mitigation credits, purchasing reinsurance, and evaluating capital and solvency. These models could be used in the context of climate modeling by considering that climate change has been altering the frequency and severity of extreme weather events. For example, warmer sea surface and sea level rise are likely to make future coastal storms more damaging and intensify tropical storm wind speed, consequently leading to more severe hurricanes[50]. Actuaries could leverage the outputs of future climate scenarios, such as CMIP scenarios representing different degrees of GHG concentration levels, as inputs into these CAT models to produce climate-adapted CAT models that can then be used to assess the impact on insurance coverages.

3.1.3 RISK MANAGEMENT

Actuaries are typically involved in various aspects of the enterprise risk management framework, such as asset liability management and conducting scenario analysis to quantify and inform insurance and market risks. Within the context of climate risk, actuaries could extend this role by contributing to identifying, assessing, and mitigating emerging climate risks.

Identifying Climate Risks

Climate risks and opportunities could be identified via the study of both historical and forward-looking data. Life insurance and pension entities would be interested in climate impacts on mortality and morbidity as discussed earlier. P&C actuaries could assess the physical hazards of the underwriting portfolio considering climate change by using historical data or future climate scenarios. This would enable the financial institution to understand what type of climate risks they are exposed to, helping to assess and mitigate the risks as the next steps.

Assessing Climate Risks

The risk assessment process could require actuaries to measure and analyze the climate risks. Actuaries are commonly involved in capital management and can expect climate risk to become part of capital frameworks in the future. Insurance regulators have already started to consider climate capital requirements for insurers. For example, in 2023, EIOPA published a consultation paper on sustainability risk, which proposes reflecting higher credit spread shocks and equity shocks from fossil-fuel-related stocks and bonds[51]. Another example is OSFI's B-15 Climate Risk Management guideline for financial institutions, which sets out the principles for maintaining sufficient capital for an entity's climate-related risks. Insurers should also expect to use scenario analysis to test capital adequacy and use the scenarios for financial

[50] Environmental Defense Fund, Hurricanes and Climate Change

[51] EIOPA consults on the prudential treatment of sustainability risks https://www.eiopa.europa.eu/eiopa-consults-prudential-treatment-sustainability-risks-2023-12-13_en

planning and analysis (FPA) and decision-making. Actuaries could also support the development of the risk appetite framework by using quantitative methods to support setting risk tolerance levels and risk limits.

Prioritizing and Monitoring Climate Risks

Actuaries can contribute to the prioritization and monitoring of climate risks using approaches already commonly used in the risk management function such as sensitivities, economic capital, or other metrics. This provides a measure of a company's exposure to various physical and transition climate risks that can be used as a basis for comparison with other risks, and a materiality assessment then helps determine which risks are most significant to the organization's financial health and operational continuity.

Actuaries can also help develop and select relevant Key Risk Indicators (KRIs) to monitor climate risks effectively. KRIs are metrics that provide early warning signals about potential risk exposures. Examples of KRIs could include physical risk indicators, such as flood risk maps or population deaths from extreme heat, and transition risk indicators, such as trends in carbon pricing or measures of GHG intensity of a company's assets. These KRIs enable continuous tracking of risk factors and provide actionable insights.

Incorporation of Climate Risks into ERM

Broadly speaking, the integration of climate-related risk management into existing enterprise risk management frameworks is consistently emphasized by the standards and regulations discussed in this paper. One approach to incorporating climate risk into the broader ERM framework is to create a risk identification grid of climate-related physical risks and transition risks mapped to the risks in traditional insurance and pension ERM, such as insurance risk, market risk, and operational risk. Under this framework, life actuaries could be responsible for mapping the physical climate risk impacts to mortality and morbidity risks, for example, while P&C actuaries could be responsible for mapping the physical climate risk impacts to personal and commercial exposures, and pension actuaries could be responsible for mapping the climate transition risk impacts to investment risks and pension funds.

3.1.4 METRICS AND TARGETS

Actuaries have a role to play in supporting the disclosure of financial sector-specific metrics and targets, particularly within insurance and asset management. The topic of GHG accounting has been under discussion for over 20 years since the release of the GHG protocol, which predates the introduction of the ISSB standards. As described earlier, the PCAF methodology for Scope 3 investment emissions includes both financed emissions and insurance-associated emissions.

One of the major challenges in GHG emissions reporting is the collection and management of third-party emissions data and the company's internal financial and insurance data, which may require approximation. Actuaries are accustomed to handling large volumes of data and developing assumptions using their professional judgment. These skills are directly transferable to the preparation of GHG emissions results. Although the calculation of GHG emissions is not extremely complex, the process requires applying many proxies and judgments, which are routine tasks for actuaries. For example, for insurance-associated emissions from personal motor lines of business, the PCAF standards calculate the attributed emissions of auto insurance using insurance premiums over the costs associated with the insured vehicles. While the costs might not be readily available, an approximate percentage can be applied based on average data. Correspondingly, P&C actuaries would play a role in this preparation work. When PCAF introduces standards for calculating the insurance-associated emissions for life and health insurance, life actuaries would have a potentially similar role to play.

In addition to the required GHG calculation and reporting for investment-associated emissions, the exercise can be further extended to incorporate dynamic modeling with scenario analysis. It is possible to project

Scope 3 investment emissions based on the projected emissions pathways of industries and regions under future climate scenarios. Consequently, this could have an impact on total future capital costs and, hence, the profitability of the company. In such a case, emissions would become one of the factors considered in optimizing the balance sheet, leading to an emissions optimization exercise[52]. Actuaries, who are well-versed in modeling techniques, could carry out such an optimization exercise.

Beyond GHG emissions, ISSB and SASB standards also propose metrics that could require actuaries to prepare the data and perform the calculations. Professional judgement would likely be necessary for disclosing these metrics given often limited data availability and modeling capacity. Actuaries would need to leverage their current skills and expertise and prepare for new climate-related metrics. Using insurance industry-based metrics required under IFRS S2 as an example, the standard necessitates the disclosure of the probable maximum loss of insured assets from weather-related natural catastrophes for each likelihood of exceedance scenario. This metric can be evaluated by a catastrophe modeling research and development team, often led by P&C actuaries who have extensive experience in traditional catastrophe modeling.

Additionally, IFRS S2 requires the disclosure of the total monetary losses attributable to insurance payouts from both modeled and non-modeled natural catastrophes. Modeled losses typically necessitate the expertise of the CAT modeling team, while non-modeled losses from smaller-scale events may require manual calculations, involving the same team beyond the scope of the CAT model. Furthermore, this disclosure must align with the incurred benefits and claims under IFRS 17 Insurance Contracts, an area where actuaries play a significant role. Actuaries' involvement ensures that the metrics are accurately calculated and reported, providing a clear picture of the insurer's exposure to climate-related risks and its financial resilience.

3.1.5 AREAS OF DEVELOPMENT FOR ACTUARIES IN CLIMATE RISK MANAGEMENT

To contribute more significantly to climate risk management, actuaries should consider developing knowledge and skills in several areas. Actuaries can enhance their role in climate risk management by acquiring a comprehensive knowledge of various data sources and analytical tools. For instance, familiarity with climate data sources, such as the National Oceanic and Atmospheric Administration (NOAA) and the National Center for Atmospheric Research (NCAR), is useful. These sources offer valuable information on climate patterns, extreme weather events, and environmental changes. Additionally, understanding climate hazard data sources like the U.S. Geological Survey (USGS) for natural hazard information and the National Flood Insurance Program (NFIP) for flood risk data is important for assessing the full spectrum of climate-related risks. Actuaries should also integrate data on energy and heating sources, such as the U.S. Energy Information Administration (EIA) and Natural Resources Canada, which provide insights into energy consumption patterns and their impacts on climate risk. Furthermore, familiarity with mortality data sources, such as the Centers for Disease Control and Prevention (CDC) and Statistics Canada, provides insights into health impacts related to climate events, including heatwaves and air quality issues. Climate risk management requires information and data from a variety of sources, and this is an area with which actuaries should build familiarity.

[52] This view is proposed by McKinsey & Company in “Managing financed emissions: How banks can support the net-zero transition” https://www.mckinsey.com/industries/financial-services/our-insights/managing-financed-emissions-how-banks-can-support-the-net-zero-transition

Moreover, understanding climate models from the Network for Greening the Financial System (NGFS) and the Coupled Model Intercomparison Project Phase 6 (CMIP6) is important. Although the detailed code underlying these models is complex, just understanding the number of models that exist and the purposes of these models is helpful. It is also useful to understand each scenario and its narrative, along with the scenario outputs. NGFS scenarios typically include output variables, such as global temperature increases, carbon dioxide concentrations, and sectoral emissions pathways, along with macroeconomic variables such as GDP and employment levels, inflation and interest rates, which help evaluate the impact of different climate policies on financial stability. CMIP6 provides detailed projections of variables, such as temperature anomalies, precipitation patterns, sea-level rise, and extreme weather event frequencies, offering critical insights into potential future climate conditions and their implications.

Additionally, expertise in geospatial data formats is important. Actuaries should be familiar with raster, NetCDF, and other formats like GeoTIFF, which are commonly used to represent spatial data. Mastery of geospatial platforms such as Python, which supports libraries for geospatial analysis, and geographic information system (GIS) software like ArcGIS and QGIS is also essential. These tools facilitate the manipulation and visualization of complex geospatial data, enabling actuaries to integrate climate and mortality risk factors into financial models and decision-making processes effectively. By mastering these and other data sources and tools, actuaries can provide valuable insights and support robust climate risk management strategies.

3.2 TAKEAWAYS

Actuaries have traditionally played key roles in risk management, modeling, and insurance. However, with the evolving standards and requirements related to climate risk, actuaries need to reassess their current roles and drive changes in the industry. The following points highlight the potential areas where actuaries can contribute:

Table 19
EXAMPLES OF ACTUARIAL INVOLVEMENT IN CLIMATE

Pillar	Potential Actuarial Involvement
Governance	• Incorporate climate risk into the Risk function and participate in the climate-related decision-making process made by the board and senior management • In the first line of defense, develop and execute climate policies, procedures, and controls • In the second line of defense, oversee first line activities, set up climate risk policies and procedures, define climate scenarios and stress testing levels, and incorporate them into ORSA • In the third line of defense, provide independent assurance on first- and second-line operations, audit processes and controls related to climate risk management • Actuaries sitting on boards oversee and approve climate risk policies, procedures, risk limits, metrics, and targets
Strategy	• Perform scenario analysis and develop firm-specific climate scenarios for resilience • Extend the use of catastrophe models to climate scenario analysis • Support climate-related strategy and decision-making such as investment strategy and product development • Develop climate-related insurance products and reinsurance programs • Evaluate climate impacts on mortality and morbidity • Quantification and qualification of the effect of climate-related risks and opportunities on a company's financials
Risk Management	• Identify climate risks by studying both historical and forward-looking data • Assess climate risks with quantification techniques and support risk appetite framework in setting up risk tolerance level and risk limit • Design effective risk mitigation solution such as reinsurance • Develop and select KRIs to monitor climate risks • Incorporate climate risk into the enterprise risk management such as mapping of climate risks to traditional enterprise risks
Metrics and Targets	• Support the data preparation and calculation for GHG accounting and incorporate GHG into scenario modeling, and investment and product strategy • Prepare for industry-specific metrics calculation and target setting

Section 4: Conclusion

IFRS S1 and IFRS S2 standards serve to create a global baseline for climate and sustainability-related financial information. Since the ISSB standards were built on top of the TCFD recommendations, they have a very similar structure with four pillars – Governance, Strategy, Risk Management, and Metrics and Targets – albeit with differences in the disclosure requirements. Regarding GHG emission measurement, the ISSB standards cross-reference the GHG Protocol and PCAF for application guidance. In the absence of specific requirements, users should also refer to and consider the applicability of GRI. Other sustainability standards such as SASB and CDP have also started aligning with the ISSB standards. Actuaries should be aware of the interoperability between ISSB and other sustainability standards to establish a comprehensive climate risk management framework.

In addition to the standards, various climate-related regulations are implemented by governments or regulatory authorities and apply to financial institutions. These include the U.S. SEC Final Rules, Canada's OSFI B-15, and Europe's ESRS. These regulatory guidelines usually incorporate aspects of the global standards discussed above with a similar structure but focus more on protecting stakeholders. The regulations enforce climate-related financial disclosure with different focuses – the U.S. SEC Final Rule is less demanding, not requiring disclosure of Scope 3 GHG emissions, scenario analysis, and industry-based metrics; Canada's OSFI B-15 focuses more on risk management, capital, and liquidity adequacy; ESRS extends the concept of materiality to both financial and impact materiality, incorporating climate considerations not only in business but also in the environment. Due to rapid regulatory changes, actuaries should pay attention to upcoming mandatory reporting requirements related to climate risk management set by regulators, which may align with ISSB requirements in the future.

The introduction of the new ISSB standard and ongoing evolution of sustainability standards are likely to increase the demand for actuarial services. Actuaries, with their expertise in risk management, financial modeling, and data analysis, are well-positioned to support financial institutions in managing their climate-related risks and opportunities across the four pillars. Under the Governance pillar, actuaries can support across the three lines of defense, and experienced actuaries could even participate as board members and senior management to make climate-related decisions and strategies. Under the Strategy pillar, actuaries could play a key role in driving climate-related scenario analysis and financial modeling. Using the results of these analyses, they could also initiate climate-related investment strategies and product development. In Risk Management, actuaries could participate in identifying, assessing, and mitigating climate risks, broadly extending to the incorporation of climate risks into the ERM framework. Under Metrics and Targets, actuaries could take on a new role in measuring GHG emissions, particularly in data preparation and calculation, and incorporating GHG emissions into scenario modeling, investment strategies, and product development. A similar role is also expected in preparing disclosures of industry-based metrics and targets, so actuaries should educate themselves accordingly.

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Appendix A: Abbreviations

Abbreviation	Definition
AAL	Annual Average Loss
AF	Accelerated Filer
CDP	Carbon Disclosure Project
CDSB	Climate Disclosure Standards Board
CSRD	Corporate Sustainability Reporting Directive
DSIB	Domestic Systemically Important Banks
EC	European Commission
EFRAG	European Financial Reporting Advisory Group
EGC	Emerging Growth Companies
EIOPA	European Insurance and Occupational Pensions Authority
EP	Exceedance Probability
ERM	Enterprise Risk Management
ESG	Environmental, Social, Governance
ESRS	European Sustainability Reporting Standards
EU	European Union
EVIC	Enterprise Value including Cash
FCA	Financial Conduct Authority
FRFI	Federally Regulated Financial Institutions
FSB	Financial Stability Board
GHG	Greenhouse Gas Emissions
GRI	Global Reporting Initiative
IAIG	Internationally Active Insurance Groups
IFRS	International Financial Reporting Standards
IRO	Impact, Risk and Opportunity
ISSB	International Sustainability Standards Board
LAF	Large Accelerated Filer
MDR-M	Minimum Disclosure Requirement for Metrics
MDR-T	Minimum Disclosure Requirement for Targets
NFRD	Non-Financial Reporting Directive
NGFS	Network for Greening the Financial System
ORSA	Own Risk and Solvency Assessment
OSFI	Office of the Superintendent of Financial Institutions
PCAF	Partnership for Carbon Accounting Financials
PML	Probable Maximum Loss
PRI	Principles for Responsible Investment
RCP	Representative Concentration Pathways
REC	Renewable Energy Certificates
SASB	Sustainability Accounting Standards Board
SBM	Strategy and Business Model
SCSE	Standardized Climate Scenario Exercise
SDS	Sustainability Disclosure Standards

Abbreviation	Definition
SEC	Securities and Exchange Commission
SME	Small and Medium-sized Enterprise
SRC	Smaller Reporting Companies
TCFD	Task Force on Climate-related Financial Disclosures

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