How Corporate ESG Reporting Is Enabled by Generative AI

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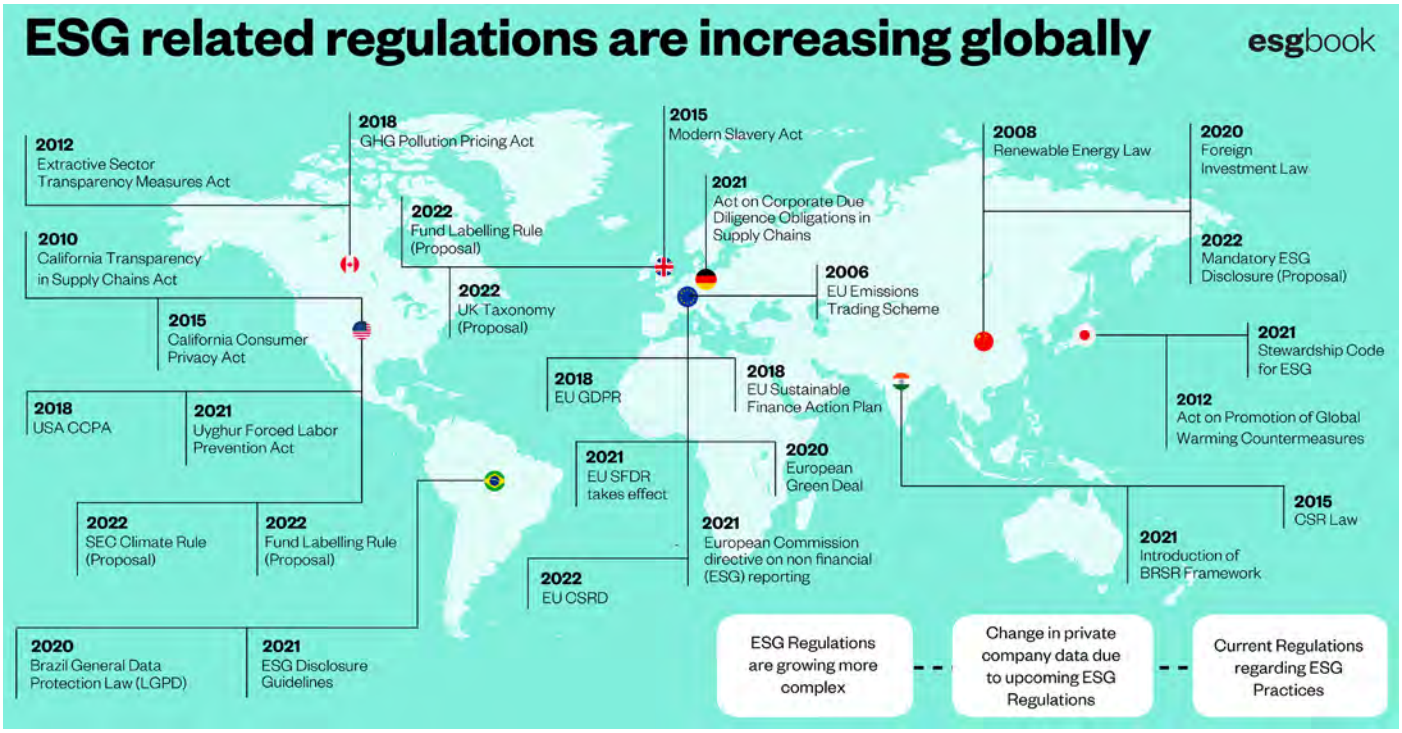
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This year, 2023, is considered by many to be the year of generative AI. It is also the year of ground-breaking ESG regulatory announcements impacting corporations, including the launch of the long-awaited global IFRS ISSB standards and the signing of two pioneering California bills, SB-253 and SB-261. This year marks a key turning point for the enterprise from voluntary, one-of-a-kind annual sustainability reports to also accommodate mandatory, standardized ESG disclosures.

Figure 1: Global ESG regulations increase by 155% over the past decade. Source: ESG Book



These new ESG regulations bring increased anxiety to corporations who are concerned with their ability to comply and submit accurate, traceable data on time. For many companies managing ESG data on tedious spreadsheets, this concern is warranted: It will be nearly impossible to achieve compliance because of the time and detail required.

For this reason, corporate sustainability teams should turn to software solutions that unify relevant ESG data and applying machine learning to accelerate reporting and produce actionable insights. Luckily, a combination of both generative AI and classical AI can help alleviate compliance anxiety.

In this blog post, ESG Book and C3 AI provide a roundup of key 2023 ESG regulatory announcements worldwide and examples of AI use cases that corporations can leverage to facilitate compliance and generate new sources of strategic insight, including:

1. Drafting questionnaire responses and natural language summaries.

2. Continuous stakeholder materiality analysis to improve stakeholder engagement and support double materiality.

3. Question and answer in natural language for interrogating and translating legalese and internal policy documents.

4. Data validation and surfacing alerts on data anomalies and errors to improve audit confidence and disclosure readiness.



Standardizing Global Regulation to Compliment Financial Statements

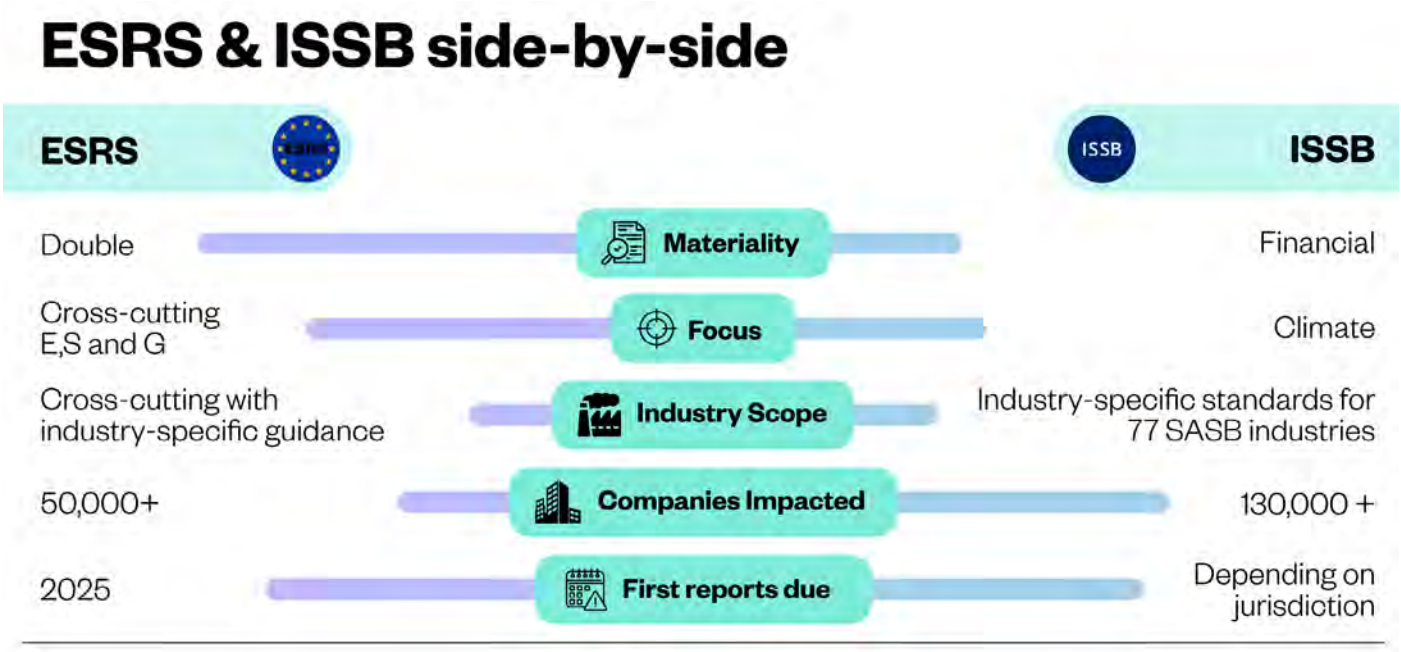
The long-awaited IFRS ISSB Standards were launched in June and aim to create a global baseline for financially material sustainability reporting. The ISSB standards (S1 and S2) introduce a common language for communicating the impact of climate-related risks and opportunities on a company's prospects. They aim to enhance trust and confidence in company disclosures about sustainability, enabling informed investment decisions.

Adoption and enforcement are up to local jurisdictions, and countries who have already endorsed ISSB include UK, Japan, and Singapore.

One particularly relevant generative AI use case for ISSB standards is questionnaire response. Pulling from both structured (e.g., tables) and unstructured (e.g., documents) data sources, AI can generate and synthesize a response to a reporting requirement. This approach accommodates the nuances between local jurisdiction adoption and supports a consistent methodology for corporates to respond to qualitative and quantitative components of the disclosure. AI can parse the requirements, identify relevant content in source systems as well as policy documents and frameworks, and then draft responses which incorporate both quantitative data and qualitative explanation.

Instead of spending months wading through data and producing a narrative from scratch, responses can be drafted in minutes accommodated by an intuitive evidence package.

Figure 2: Comparison of ISSB Standards to ESRS Corporate Sustainability Reporting Directive (CSRD). Source ESG Book



The International Sustainability Standards Board (ISSB) released IFRS S1 and IFRS S2, marking a major step in sustainability disclosures. The standards are designed to be used globally alongside financial statements, creating a comprehensive baseline. The ISSB will support adoption, establish a Transition Implementation Group, and collaborate with jurisdictions and reporting standards organizations to ensure effective implementation and reporting.

Attempting to address the growing number of emerging mandatory regulatory ESG disclosures, a significant policy trend that emerged in 2023 is the global push for harmonized sustainability standards. Regulators from the UK, Japan, and Singapore, recognizing the importance of consistent reporting, endorsed the International Sustainability Standards Board (ISSB) S1 and S1 standards. This alignment aims to enhance comparability and credibility in ESG disclosures across jurisdictions.

Moreover, the endorsement of ISSB by the International Organization of Securities Commissions (IOSCO) reinforces the standard's acceptance and potential for widespread adoption. However, since the ISSB standards require country adoption and enforcement, it is impossible to avoid the prevalence of differences between requirements and enforcement mechanisms entirely.

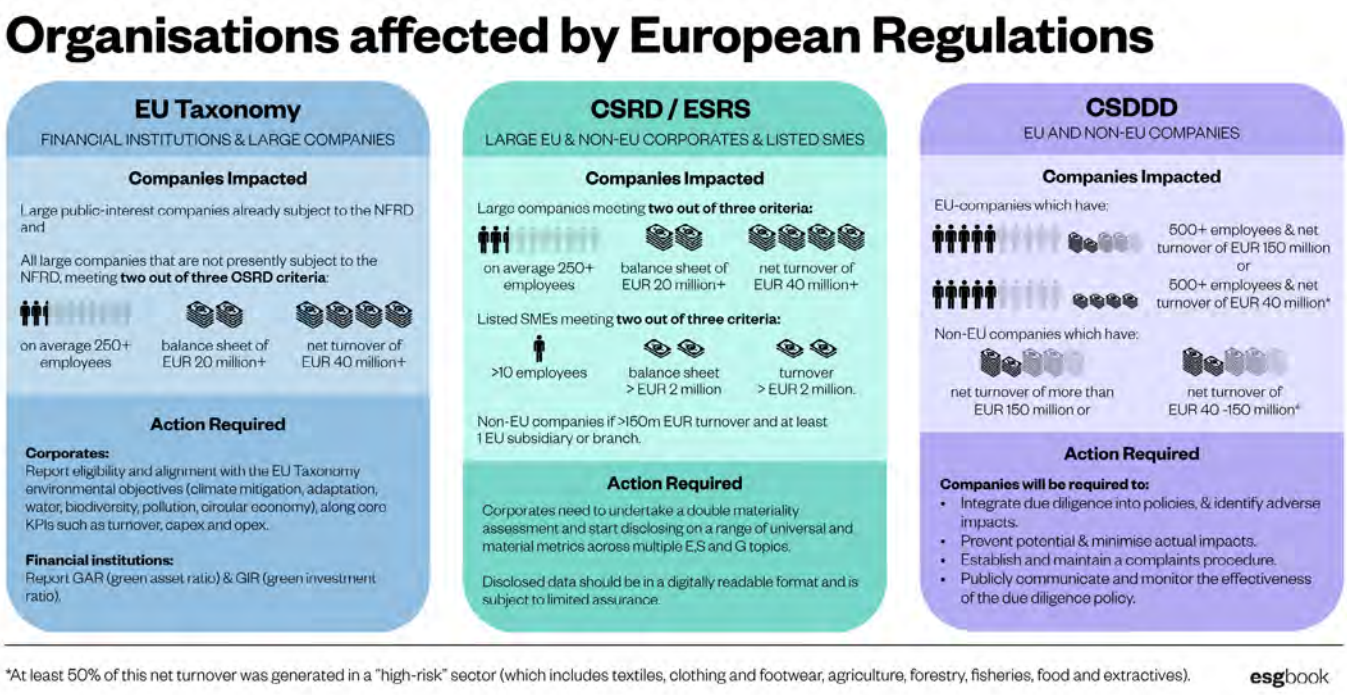
The ISSB's definition of materiality emphasizes information that, if omitted or obscured, could reasonably impact investor decisions from a financial standpoint. This includes considering double materiality, which considers impacts on customers, suppliers, and the environment, encompassing sustainability-related risks and opportunities. While financial factors like cash flow, access to finance, and cost of capital are evaluated for their effect on a company's financial position, the emphasis is on their financial implications rather than their broader impact on the company's sustainability efforts.

The ESRS, in contrast, aimed to ease reporting rules with CSRD but faced investor criticism over double materiality reporting. It is anticipated that ISSB-aligned disclosures will align with ESRS while potentially needing to fulfil additional reporting demands. This evolving landscape reflects the intricate balance between regulatory clarity and investor needs.

Comprehensive Sustainability Reporting in the EU

The European Commission passed multiple notable ESG regulations in 2023. For example, the European Sustainability Reporting Standards (ESRS) delegated act was introduced, focusing on the concept of 'materiality,' which requires companies to identify mandatory reporting aspects under the Corporate Sustainability Reporting Directive (CSRD). The European Commission also unveiled its latest sustainable finance package which has a sweeping scope across the EU Taxonomy, ESG ratings, and transition finance. Finally, the European Parliament passed the Nature Restoration Law which seeks to enhance biodiversity and climate action to preserve a habitable environment for current and future generations.

Figure 3: European Regulations impact companies worldwide. Source ESG Book



Generative AI can help companies address the double materiality requirement. This aspect of the CSRD involves a more rigorous look at stakeholder perception and risk analysis. Advances in natural language processing (NLP) and large language models (LLMs) can replace the existing manual materiality assessment process and provide continuous insights.

AI allows sustainability teams to reorient these occasional, limited-scope, backwards-looking materiality studies into near-real-time solutions that greatly expand the range of information included — potentially analyzing up-to-date publications from every non-profit, customer, investor, and competitor.

Generative AI is a significant unlock for such a solution that can provide continuous and actionable feedback to mitigate potential ESG risks, improve stakeholder engagement, and capture new opportunities.

The European sustainability reporting standards (ESRS) delegated act

In the first delegated act, the European Commission outlines essential reporting information in relation to cross-cutting standards and EU legal frameworks.

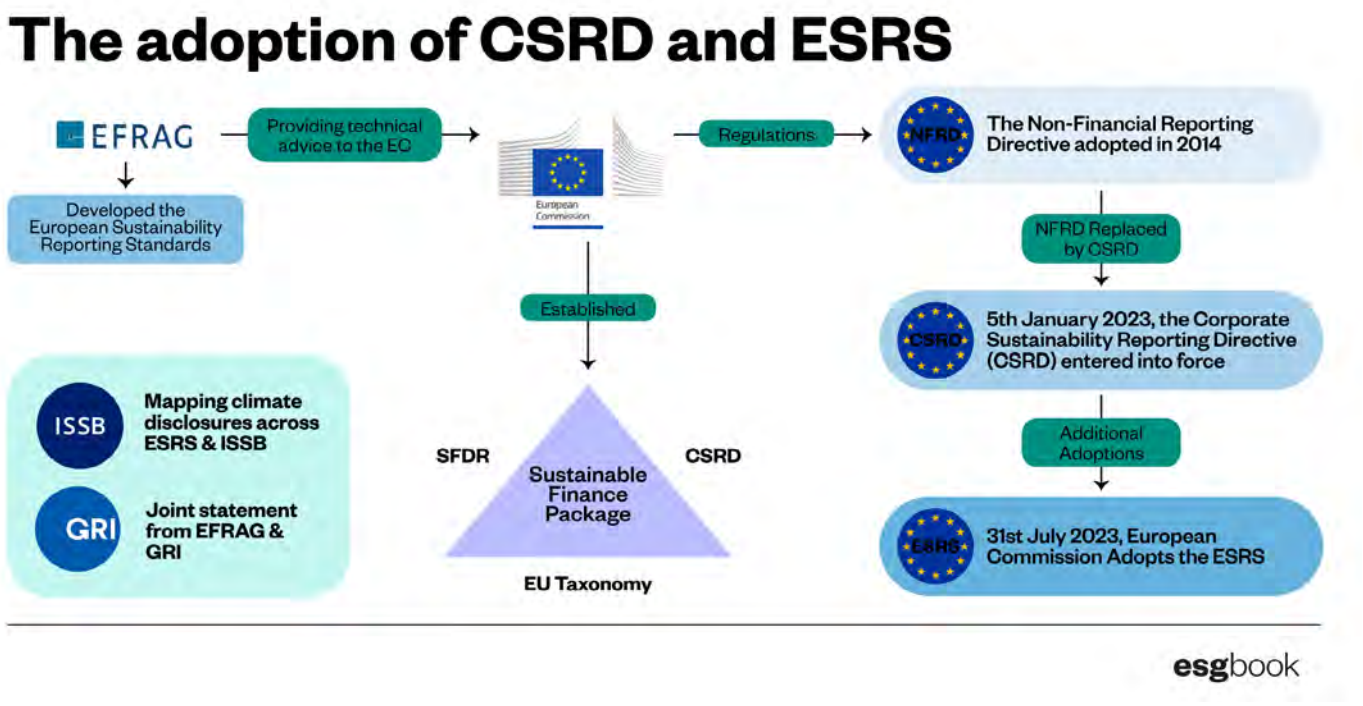
Central to the act is the concept of 'materiality', requiring companies to determine which aspects of the Corporate Sustainability Reporting Directive (CSRD) are mandatory for them. All standards and corresponding disclosure requirements will undergo double materiality assessment, except for those in the 'General disclosures' section, allowing companies to focus exclusively on those sustainability-related impacts, risks and opportunities which are most relevant to them.

Smaller companies have flexibility in the initial years, allowing omission of certain disclosures such as Scope 3 GHG emissions and workforce-related information.

Proposed mandatory reporting metrics may become voluntary, providing an extra year for disclosure. An interpretation mechanism and educational resources will ensure clarity and support in implementing the standards.

The aim is to strike a balance between comprehensive reporting and reducing the burden, particularly for smaller businesses. Stakeholders have until July 7 to provide input on the draft act.

Figure 4: Historical timeline of adopting CSRD and ESRS. Source: ESG Book



European Commission Sustainable Finance Package

On 13 June 2023, the European Commission unveiled its latest sustainable finance package which covers crucial aspects of environmental, social and governance (ESG) regulation in the EU including the EU Taxonomy, ESG ratings, and transition finance. Prior to the release of the

package, the ESG ratings industry had been put on notice as policy action for increased oversight had been gaining momentum.

One of the key measures in the package is a proposed regulation seeking to address deficiencies in the operations of ESG ratings providers and enhance transparency around sustainability ratings and scores. A second part of the package expands the Taxonomy Regulation to include new criteria for economic activities related to environmental objectives. In its efforts to facilitate transition finance, the Commission also released a draft recommendation outlining the concept of transition finance, linking it to the Paris Agreement and EU climate neutrality.

The latest policy initiative shows that regulators are zeroing down on a balanced approach for providing market certainty and clarity, while not stifling innovation.

EU adopts position on Due Diligence Directive

The European Parliament has adopted its position on the Corporate Sustainability Due Diligence Directive (CSDDD). The regulator has a strong message promoting sustainable and responsible corporate practices through the integration of human rights and environmental risks into companies' operations and governance.

The rules require businesses to address the adverse impacts of their actions within and outside of Europe, including in their value chains. These rules will apply to EU-based companies with over 250 employees and a turnover of over EUR 40M and to parent companies with 500 or more employees and turnover of EUR 150M, regardless of sector. The recognition of the financial sector is seen as a gamechanger and an important step forward. However, some amendments, such as the deletion of Article 26 on overseeing due diligence, were regrettable according to stakeholders.

The final position of the European Parliament will now enter inter-institutional negotiations, and discussions are expected to be finalized by the end of the year.

European Parliament Nature Restoration Law

The EU's new Nature Restoration Law, passed by the European Parliament on 12 July 2023, aims to enhance biodiversity and climate action.

It seeks to ensure a habitable environment for current and future generations, where land and seas can continue to provide essential goods and services for our lives and economies. The law aligns with the EU biodiversity strategy for 2030, recognizing that climate action involves both reducing greenhouse gas emissions and protecting nature.

The Nature Restoration Law will build on the EU LIFE program's success, which has funded numerous environmental protection and climate action projects since 1992. As the region faces alarming environmental decline, with more than 80% of habitats in poor condition, the law emphasizes the restoration of wetlands, rivers, forests, grasslands, marine ecosystems, and the species they support.

Members of the EU Parliament (MEPs) highlighted ecosystem restoration as vital to combat climate change and biodiversity loss, without requiring new protected areas or obstructing renewable energy projects that serve the public interest. The law aligns with the EU's biodiversity strategy for 2030 and emphasizes the restoration of habitats facing environmental decline.



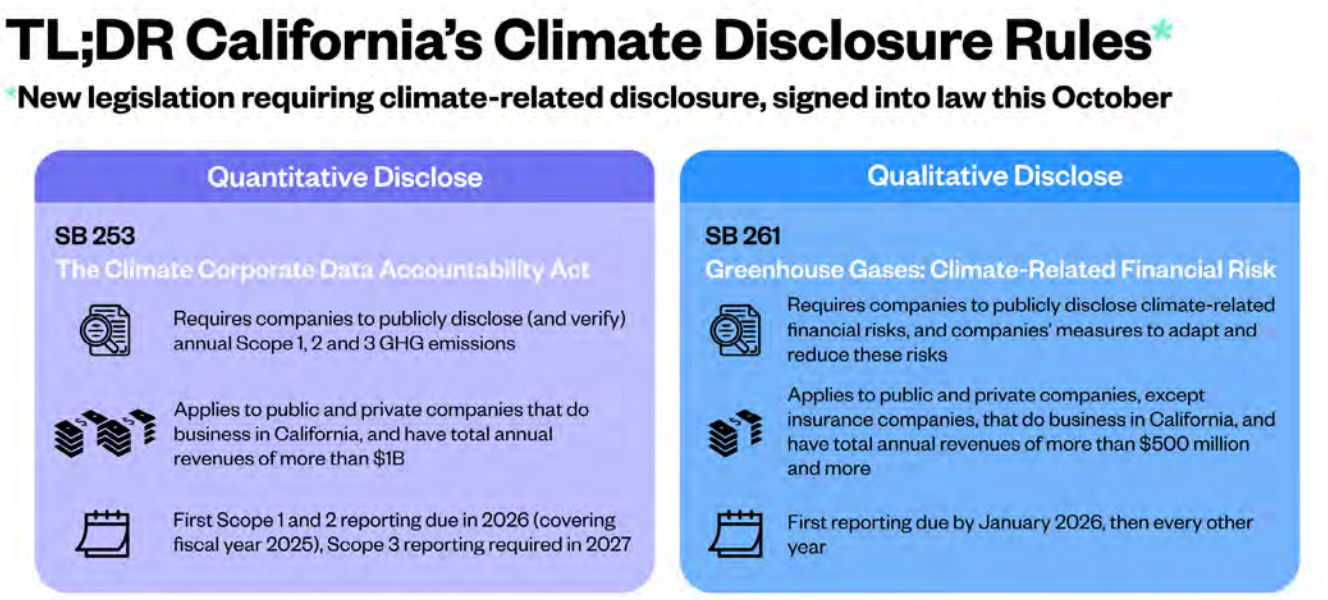
Supply Chain Focus in North America

This year marked an important shift in North America's efforts to hold corporations accountable for responsible business conduct, including within their supply chains.

California passed two key climate laws mandating GHG-emissions disclosure for all companies operating in the state. Wielding its influence as the fifth largest global economy, California's legislation stands out by mandating Scope 3 emissions disclosure for many U.S. and foreign companies headquartered outside the state.

Moreover, Canada enacted the Modern Slavery Act, which requires government institutions, private-sector entities, and eligible importers to report measures against forced labour and child labour in their supply chains.

Figure 5: The impact of California's TL;DR extends beyond the US. Source: ESG Book



AI provides a key use case for anomaly detection to ensure that submitted emissions calculations are accurate. This is an especially prevalent issue for quantifying value chain (Scope 3) emissions, which involve significant aggregation with many embedded assumptions and input sources.

For example, a company may calculate a total Scope 3 emissions value that includes tens of thousands of inputs from internal teams, contractors, suppliers, end users, and distributors. It is frustrating for sustainability teams when the aggregated metric looks "off," but there isn't enough time to wade through spreadsheets to manually find the issues.

Instead, companies should leverage AI for data validation and anomaly detection, especially in preparation for now-required 3rd party audit. The ML pipeline can quickly identify data that are most important for a carbon analyst to investigate.

Furthermore, by generating alerts on erroneous datapoints before the aggregated performance measure is even calculated, the reporting and audit process can be accelerated with confidence.

California Bills SB-253 and SB-261

On October 7, 2023, Governor Gavin Newsom signed two pioneering California bills, SB-253 and SB-261, into law. These laws mandate extensive climate disclosures from specific public and private U.S. companies operating in California, surpassing the Securities and Exchange Commission's (SEC) proposed regulations.

The bills cover both public and private companies based on revenue, requiring them to disclose greenhouse gas emissions and climate-related financial risks. Approximately 10,000 companies, including many privately held ones, could be affected. Penalties for non-compliance range up to $500,000.

What sets these bills apart is their use of existing disclosure frameworks, making it easier for companies to comply with various regulatory requirements. And in light of this expected announcement of the SEC's Climate Rule in October 2023 (Q4), California can be seen as a trailblazer in terms of setting out ambitious targets for corporate transparency on climate change.

SB-253 and SB-261 require companies to disclose their GHG emissions and climate-related financial risks. What sets these bills apart is their applicability to both public and private U.S.-based companies, contingent on their total annual revenue. Notably, companies subject to these bills must provide disclosures for Scope 3 GHG emissions regardless of materiality. They also need to offer limited assurance for Scope 1 and Scope 2 GHG emissions in their initial year of reporting, with the possibility of extending this assurance to Scope 3 emissions starting in 2030.

One of the distinctive aspects of these bills is their revenue-based criteria for application. This means that even private companies, which would typically escape climate reporting under the SEC's proposed rules, might be obligated to comply if they meet the revenue thresholds and operate in California. However, the bills lack a clear definition of what constitutes "doing business in California," leaving room for further clarification in the future.

Based on California tax law concepts, it's suggested that the threshold for doing business in the state could be relatively low. Also, these bills are notable not just because they expand the scope of climate disclosure regulations but also because they align with existing disclosure frameworks such as the GHG Protocol and TCFD.

This alignment enables companies to potentially use their GHG emission and climate-risk information for various disclosure purposes, including reporting in California, thereby streamlining compliance efforts across different regulatory requirements.

Canada Modern Slavery Act

Canada's Modern Slavery Act (MSA) to combat forced labour and child labour in supply chains was successfully passed on May 3, 2023. This significant legislation will be enforced starting from January 1, 2024.

Following its implementation (as of May 31, 2024), government institutions, private-sector entities, and importers that meet a specified threshold are obligated to report on the measures taken to prevent and mitigate the risk of forced labour and child labour across their supply chain operations.

Canada's MSA also amends the Customs Tariff, effectively enabling the prohibition of importing goods that have been wholly or partially manufactured or produced using forced labour or child labour, as defined in the Act.

Establishing ESG Disclosure Standards in Asia

Across Asia, key economies are taking decisive steps to establish robust ESG disclosure standards. India has introduced the Business Responsibility and Sustainability Report (BRSR) Core framework, incorporating global ESG indicators and focusing on phased implementation based on market capitalization.

Hong Kong seeks to enhance its ESG reporting by mandating climate-related disclosures under four core pillars, emphasizing comprehensive climate risk and opportunity assessment. Singapore, long seen as the regional leader in sustainability, plans to adopt ISSB aligned standards, with mandatory climate reporting proposed for listed and non-listed companies. These initiatives collectively underscore Asia's resolve to integrate sustainability into the heart of its financial markets.

Wading through evolving disclosure documentation and various internal policies to ensure compliance is a cumbersome task for a large, global corporation. With many different jurisdictions establishing ESG regulations across Asia, it can be hard to keep track of the key details such as eligibility, enforcement dates, and required data elements. To make things more difficult, many of these regulations are still evolving through various legal systems and community input.

Leveraging generative AI technology as a knowledge assistant for asking questions and receiving answers in natural language can help sustainability teams efficiently retrieve details shrouded in legal language.

Further, leveraging a RAG (retrieval augmented generation) generative AI architecture like C3 AI's ensures that responses can be trusted because the language and retrieval models are kept separate and answers include excerpts from and links to source files. The responses are restricted to only reference designated source systems, files, and datasets, preventing hallucination and leakage of sensitive data.

HKEX proposes mandatory climate reporting from 2024

Hong Kong Exchanges and Clearing Limited (HKEX) is soliciting feedback on proposed changes to the ESG reporting framework, with a specific focus on enhancing climate-related disclosures by listed issuers.

The proposed changes include mandating all issuers to make climate-related disclosures in their ESG reports, moving away from the current "comply or explain" approach. The new disclosures would be organized under four core pillars: Governance, Strategy, Risk management, and Metrics and targets, and would cover various aspects related to climate-related risks and opportunities, governance processes, financial effects, GHG emissions, and industry-based metrics. Interim provisions would allow issuers time to comply, with emissions reporting (including Scope 3) expected for financial years commencing on or after 1 January 2026.

The consultation paper is released ahead of the finalization of the ISSB Standards to give issuers more time to review and prepare for the proposed climate-related disclosures.



Predictions for ESG Policy and the AI Horizon

Anticipated developments in the data tagging and reporting taxonomy landscape are on the horizon. For example, Brazil and the UK are set to unveil their initial taxonomy drafts by 2023 year-end (largely based off ISSB). Concurrently, India is forging ahead with its sustainable finance taxonomy, while China is embarking on the creation of fresh corporate ESG disclosure standards.

These global initiatives signify a concerted push toward aligning financial activities with environmental and social objectives, although the success and harmonization of these diverse efforts remain subjects of ongoing observations. As a result, data accuracy and transparency issues for corporates are intensifying.

Advancements in climate disclosure and incorporating double materiality are also taking shape. The US SEC's Climate reporting rule, slated for potential completion this fall, could signify adjustments to materiality thresholds and Scope 3 disclosures, despite existing exemptions for smaller companies.

These developments also involve considerations of safe harbour provisions and legal compliance, reflecting the intricate interplay between environmental transparency and regulatory frameworks. For this reason, a materiality tool providing explainable, continuous ESG stakeholder analysis will continue to provide significant value for corporates.

The accelerating pace of ESG policy evolution comes hand in hand with corporate demands for new software tools. Leveraging AI for automated questionnaire response, stakeholder materiality analysis, natural language Q&A, and anomaly detection offers a valuable tool for the enterprise response.

As AI technologies including generative AI continue to evolve, so too will the opportunities for high value use cases that apply to ESG reporting and performance management. AI will continue to grow as a critical enabler of corporate ESG success.

Learn More

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