

Disparities in Climate Scenario Reporting: An Analysis of Developed and Developing Economies

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ABSTRACT

This study examines the quality gap in climate scenario analysis between developed and developing countries. The research compares climate-related disclosures from companies in both developed and developing countries, focusing on the quality of their climate scenario analyses, including transition risks, physical risks, and opportunities. Using data from companies listed in the TCFD, the study analyzes disclosures from 2020 to 2023 and reveals that companies in developed countries are more proactive in providing comprehensive and transparent climate-related information, driven by stronger regulatory frameworks, investor pressures, and greater technological capacity. In contrast, companies in developing countries face significant challenges due to gaps in resources, expertise, and regulatory readiness. The research highlights the implications of these disparities for global efforts to address climate change and emphasizes the need for capacity-building, regulatory harmonization, and enhanced cross-border collaboration. The study also suggests future research exploring the impact of IFRS S1 and S2 post-implementation on climate-related disclosures.

Keywords : *Climate Scenario Analysis, Climate-related Disclosures, TCFD, IFRS S1 S2, Governance, Transparency.*

INTRODUCTION

The increasing recognition of the importance of climate scenario analysis in evaluating climate-related risks and opportunities has led to its integration into the IFRS S1 and S2 standards, which became mandatory for companies starting in 2024. This initiative, first introduced by the Task Force on Climate-related Financial Disclosures (TCFD) in 2017, has played a significant role in improving the transparency and accountability of climate-related financial disclosures.

The climate scenario analysis process involves considering a range of global temperature scenarios, including those in line with the Paris Agreement (under 2°C) and higher temperature scenarios (3-4°C) to reflect more extreme risks (Krey, 2014). Companies must also identify the relevant time horizons—short-term (1-5 years), medium-term (5-10 years), and long-term (over 10 years)—to understand better the impacts of climate change across different time scales (Slawinski & Bansal, 2012; Zaheer et al., 1999). The TCFD framework encourages companies to assess climate risks across various scenarios, including transition risks and physical risks, while also identifying opportunities related to climate change (Huiskamp et al., 2022). In the context of these frameworks, transition risks include regulatory

changes, technological advancements, market shifts, and investor pressures towards a low-carbon economy. These risks can lead to financial challenges and supply chain disruptions, particularly as companies face higher operating costs due to carbon taxes and regulatory compliance (Reboredo & Ugolini, 2022; Sanderson et al., 2019). Meanwhile, physical risks— both acute and chronic—have the potential to disrupt operations and supply chains, posing additional financial risks (Altay & Ramirez, 2010; Spiegeleer et al., 2023).

Companies in developed nations have largely adopted climate scenario analysis under the TCFD guidelines, facilitating a smoother transition to IFRS S1 and S2. However, implementing these standards in developing countries has faced considerable challenges. Developing countries face obstacles in terms of regulatory readiness, resources, and investor pressure. Companies in developing countries, such as Indonesia, face challenges due to gaps in regulatory frameworks, resources, and expertise in climate reporting (Amran et al., 2014). The adoption of these standards in Indonesia is still in discussion, with full implementation expected by 2026 and mandatory compliance by 2027. This delayed adoption results in a significant gap in the quality and comprehensiveness of climate scenario analysis between developed and developing countries (Wahyuni, 2025). Moreover, the disparity in climate risk disclosures between these economies impedes global efforts to address climate change, as developing countries often lack sufficient incentives for transparent reporting (Cordova et al., 2021; Nahar et al., 2020). This gap in climate scenario analysis and reporting quality is significant and calls for further exploration of how developing and developed countries compare in adopting climate scenario analysis and in the quality of their climate-related disclosures.

Thus, this study aims to explore and compare the climate scenario analysis practices between companies in developed and developing countries, with particular focus on the quality of their disclosures and how these gaps affect the global effort to mitigate climate change. According to the existing literature, there has been limited research specifically addressing this gap in the context of developing nations, making this study crucial in bridging that knowledge (Bhatia & Tuli, 2018; Vandenberg & Cohen, 2010). This research uses data from companies listed in the TCFD hub report and classifies countries based on the World Bank's classification. The data is then analyzed through document reviews of companies' climate scenario analysis disclosures from 2020 to 2023.

Using a case study method, the results show that companies in developed countries are more active in disclosing climate-related information than those in developing countries, both in the number of reporting companies and in the distribution of reports each year. In developed countries, the sector that reports the most is Financials, while in developing countries, the dominant sector is Extractives & Mineral Processing. Regarding risk disclosures, more companies in developed countries provide complete disclosures on transition risk, physical risk, and opportunities, as there are significantly more reporting companies in those nations.

The findings on the time horizon indicate that developed countries generally set longer-term planning periods, with many companies choosing horizons between 2020 and 2050, or even until 2100. In contrast, companies in developing countries tend to focus on shorter periods, such as 2020 to 2030 or 2030 to 2050, suggesting they may still be in the planning and faster-adaptation phases.

In conclusion, this study not only describes the state of climate scenario analysis in developed and developing countries in implementing climate scenario analysis but also lays a foundation for enhancing transparency and accountability in climate risk reporting, particularly in countries still facing challenges in adopting international standards. With a focus on both developed and developing countries, this study is expected to provide insights for regulators, companies, and investors on the challenges and strategies to improve accountability and transparency in global sustainability reporting. Practically, this research provides a deeper understanding of the implementation of climate scenario analysis in companies, offers a perspective on climate scenario analysis disclosures for companies in developing countries, and provides guidance on preparing more effective sustainability reporting despite resource limitations. Furthermore, this study can guide companies in identifying opportunities in the transition to a green economy and enhancing resilience against transition and physical risks.

Theoretically, this study will enrich the literature on climate scenario analysis, particularly in the context of the implementation differences between developed and developing countries. It will also contribute to the development of governance and transparency theories in sustainability disclosures, considering factors such as regulatory infrastructure, company capacity, and investor pressure, which influence the quality of reporting in both types of economies. This research may expand the understanding of how gaps in climate scenario reporting impact global collective efforts to address climate change. On the policy side, the findings of this study are expected to contribute to the development of climate risk and sustainability management policies at both the national and international levels. This research could serve as input for policymakers in developing countries to improve governance in economic and business aspects. Additionally, it could aid international institutions in formulating policies to assist companies in developing countries in implementing these standards, to encourage and expedite the adoption of climate reporting standards through the harmonization of domestic regulations with IFRS, and to enhance companies' capacity in preparing sustainability reports. The results of this research can also help investors and stakeholders make more data-driven and sustainable investment decisions and promote collaboration between developed and developing countries to accelerate the harmonization of sustainability reporting and climate risk disclosures.

REASERCH METHOD

This study aims to compare the quality of annual reporting between developed and developing countries. The classification is based on the World Bank, comparing high-income economies, lower-middle-income economies, and upper-middle-income economies. Developing nations face greater challenges in adapting to climate change because they have fewer resources than developed nations.

This study is based on an analysis of company documents, including those that disclose TCFD-related information on the website <https://www.tcfhub.org/reports>. The reporting period is set from 2020 to 2023. The choice of 2020 as the starting point is based on the TCFD's first report in 2017, which marked the beginning of voluntary climate disclosures by companies. These disclosures were not optimal at that time, and the first report was updated every year, with the assumption that by 2020—being the third year—companies had improved their climate disclosures in quality. The period up to 2023 was chosen because, by then, climate scenario analysis was still voluntary under the TCFD guidelines. Starting in 2024, these standards have been adopted by IFRS through IFRS S1 and S2 and are being implemented effectively.

This study uses a case study methodology based on Yin's (2018) approach to explore how the quality of climate-related disclosures in company reports aligns with the TCFD's climate scenario analysis. The study focuses on companies that have reported on climate-related aspects in their reports, aiming to understand the extent of transparency and the quality of their disclosures. Data are systematically hand-collected from various company documents, including the type of report used to disclose climate-related information, the temperature limits or scenarios referenced in the climate scenario analysis, and the time horizon/limit year used in these scenarios. Furthermore, this study also examines the references used, such as TCFD frameworks or other standards, to assess the extent to which companies refer to globally recognized reporting practices. Further analysis examines how companies disclose aspects of transition risk, physical risk, and climate change opportunities.

RESULT AND DISCUSSION

This study includes 187 companies that have reported climate-related disclosures in their reports. With a reporting period from 2020 to 2023, the total number of observations in this study is 748 firm-year observations. The data are then categorized based on the economic classification of countries, namely developed countries and developing countries, to compare the quality and consistency of climate reporting between these two economic groups.

Table 1. Distribution of Countries and Years

Developed						Developing		
Country						Country		
Japan	15	9,7	Finland	4	2,6	India	7	21,2
United Kingdom	22	14,3	Denmark	4	2,6	Mexico	5	15,2
United States of America	17	11,0	Sweden	4	2,6	Philippines	5	15,2
France	15	9,7	Norway	3	1,9	South Africa	5	15,2
Australia	12	7,8	Republic of Ireland	2	1,3	Brazil	4	12,1
Germany	12	7,8	Singapore	2	1,3	Colombia	3	9,1
Canada	11	7,1	Taiwan	2	1,3	Russia	3	9,1
Netherlands	9	5,8	Austria	1	0,6	Malaysia	1	3,0
Spain	6	3,9	Hong Kong	1	0,6	Total	33	100
Switzerland	6	3,9	Belgium	1	0,6			
Italy	4	2,6	Portugal	1	0,6			
			Total	154	100			

Year			Year		
2023	133	21,6	2023	28	21,2
2022	139	22,6	2022	29	22,0
2021	145	23,5	2021	28	21,2
2020	131	21,3	2020	27	20,5
N/A	68	11,0	N/A	20	15,2
Total	616	100,0	Total	132	100

Table 1 presents the distribution of companies by country of origin: 154 (82.4%) from developed countries and 33 (17.6%) from developing countries. Among the developed countries, the United States has the highest number of reports (17 companies, 11.0%), followed by the United Kingdom (22 companies, 14.3%), Japan, and France (both with 15 companies, 9.7%), and Germany (12 companies, 7.8%). In contrast, in the developing country category, climate disclosures are dominated by India (7 companies, 21.2%), followed by Mexico and the Philippines (5 companies each, 15.2%), and South Africa (5 companies, 15.2%).

In terms of annual distribution, the majority of reports from developed countries are concentrated in 2021 (145 reports, 23.5%), followed by 2022 (139 reports, 22.6%), 2023 (133 reports, 21.6%), and 2020 (131 reports, 21.3%), while 68 reports (11.0%) fall under the N.A. category. Similarly, reports from developing countries also show a comparable pattern, with the highest number in 2021 and 2023 (28 reports each, 21.2%), followed by 2022 (29 reports, 22.0%), 2020 (27 reports, 20.5%), and Not Available. (15.2%).

It can be concluded that the number of reports per year varies, indicating that not all companies report climate disclosures consistently over the four years. A total of 116 companies from developed countries and 25 companies from developing countries reported fully during this period. Meanwhile, other companies did not have complete reports for all four years for various reasons, such as not disclosing climate information in a particular period, unavailable reports for certain years, or omitting the information and reporting it in other documents not identified in this study. Additionally, some companies did not disclose climate information in detail in their reports, resulting in non-analyzable climate disclosure data; all these conditions were recorded under the "not available" (N/A) category.

This result shows that companies in developed countries are more active in climate disclosures than those in developing countries, both in the number of

companies reporting and in the annual distribution of reports. This difference may reflect higher levels of preparedness, regulation, and stronger pressure from investors and stakeholders in developed countries than in developing countries. However, the relatively similar annual distribution patterns indicate that awareness of climate disclosure is increasing in both groups of countries. This finding is also supported by research indicating that developing countries face greater challenges in adapting to climate change due to limited resources and technological capabilities compared to developed nations. Adaptation efforts in developing countries require mainstreaming climate change considerations into development plans (Mertz et al., 2009). To accelerate developing countries' participation in climate agreements, strategies must be designed to promote their economic growth while addressing emissions (Galeotti & Buchner, 2003).

Table 2 presents the distribution of report types used by companies to disclose climate-related information, broken down by developed and developing countries. In developed countries, the most commonly used reports are the Annual Report or Integrated Report (25.5%), Sustainability Report (16.9%), and Climate Report (13.6%), indicating that companies in developed countries tend to integrate climate information into their annual or sustainability reports. In contrast, in developing countries, the dominant reports are the Annual Report or Integrated Report (36.4%), Climate-Specific Report (18.2%), and Sustainability Report (7.6%), suggesting that companies in developing countries rely more on climate-specific reports than on general sustainability reports. It highlights that, although developed countries are more consistent in climate reporting, there is variation in the approach used by both economic groups to communicate climate-related information.

In response to this data, many companies still report climate information separately from their Annual Report or Integrated Report. It can lead to fragmented information, which ultimately makes it difficult for investors and stakeholders to understand the impact of climate on the company's financial performance. In this regard, the adoption of the TCFD in IFRS S1 and S2 requires climate disclosures to be included in the main financial reports. These standards aim to integrate sustainability information with financial reporting, moving towards a unified corporate communication model (Avi & Casarin, 2022; Cojocaru & Mihaila, 2024). While the standards maintain separate documents for financial statements and sustainability information, they emphasize the financial impacts of sustainability issues (Avi & Casarin, 2022; Cavlak, 2022).

Table 2. Report Type Distribution

Developed					Developing				
Type of Report					Type of Report				
Annual Report or Integrated Report	157	25,5	Climate Change Report	3	0,5	Annual Report or Integrated Report	48	36,4	
Sustainability Report	104	16,9	Climate Disclosure Statement	3	0,5	Climate-Specific Report	24	18,2	
Climate Report	84	13,6	Climate action plan	3	0,5	Sustainability Report	10	7,6	
Integrated Report	41	6,7	Corporate Responsibility Report	3	0,5	Integrated Report	9	6,8	
Climate-Specific Report	33	5,4	ESG Databook	3	0,5	TCFD Report	6	4,5	
Universal Registration Document	19	3,1	Climate Disclosure Report	2	0,3	CDP Report	4	3,0	
TCFD Report	12	1,9	Strategic Report	2	0,3	Climate change supplement	4	3,0	
TCFD REPORT	9	1,5	Activity Report	1	0,2	Basel Pillar 3 disclosure	1	0,8	
Corporate Report	8	1,3	CDP Report	1	0,2	Climate Report	1	0,8	
Integrated Reporting	8	1,3	Climate Journey Report	1	0,2	Others	5	3,8	
Universal Registration Document	7	1,1	Climate action report	1	0,2	N/A	20	15,2	
Climate Transition Action Plan	5	0,8	Climate and Alignment Report	1	0,2	Total	132	100	
ESG Report	5	0,8	Net Zero and Climate Risk Report	1	0,2				
Annual and Sustainability Report	4	0,6	Report on the impact of climate change	1	0,2				
			Resilience Of Origin's Generation Portfolio to A Low-Carbon						
CDP CLIMATE CHANGE RESPONSE	4	0,6	Economy Report	1	0,2				
Climate Report/TCFD Report	4	0,6	Update on TCFD Report	1	0,2				
Group Report	4	0,6	Others	4	0,6				
Integrated Annual Report	4	0,6	N/A	68	0				
Non-Financial Report	4	0,6	Total	616	100				

Table 3 shows the distribution of sectors and industries of companies reporting climate-related disclosures, differentiated between developed and developing countries. In developed countries, the sectors with the highest reporting are Financials (29.9%), followed by Infrastructure (20.1%), and Extractives & Mineral Processing (14.3%) and Resource Transformation (13.6%). These sectors are highly exposed to financial and physical risks from climate change, making them more proactive in climate disclosures. Meanwhile, in developing countries, the dominant sector is Extractives & Mineral Processing (36.4%), followed by Financials and Infrastructure (both 18.2%), and Technology & Communications (15.2%). It indicates that the heavy industry and energy sectors in developing countries are more active in climate reporting than other sectors, likely due to regulatory pressure or demand from global investors.

At the industry level, in developed countries, the most active industries in reporting climate information are Commercial Banks (15.6%), Electric Utilities & Power Generators (13.6%), and Insurance (8.4%). It reflects the financial industry's significant interest in climate risk transparency, given its ties to investment and risk management. In developing countries, the most dominant industries are Commercial Banks (15.2%), followed by Metals & Mining (12.1%) and Electric Utilities & Power Generators (9.1%). It suggests that the energy and natural resources sectors in developing countries are more exposed to climate risks, leading to more active reporting.

Overall, the financial and energy industries are the most active in disclosing climate-related information, both in developed and developing countries. It is consistent with an analysis of SEC filings, which reveals that companies primarily focus on gas emissions, carbon risk, climate change, and financial impacts when disclosing climate-related issues (Raghupathi et al., 2023). Financial institutions are

integrating climate risk into investment decisions through ESG considerations, particularly by scrutinizing environmentally sensitive industries such as oil and gas (Dye et al., 2021). Mandatory climate-related disclosure has led to reduced financing of fossil fuel companies by institutional investors (Mésonnier & Nguyen, 2020). However, the distribution pattern in developed countries is more diverse, with involvement from sectors such as technology, manufacturing, and pharmaceuticals, whereas in developing countries, reporting remains concentrated in sectors with more direct environmental impacts. It indicates that regulations and investor pressure in developed countries are driving companies across industries to be more transparent in their climate disclosures. In contrast, in developing countries, reporting is more influenced by industries with higher environmental risks.

Table 3. Distribution of Sector and Industry

Developed					Developing				
Sector					Sector				
Financials	184	29,9	Food & Beverage	32	5,2	Extractives & Mineral Processing	48	36,4	
Infrastructure	124	20,1	Transportation	28	4,5	Financials	24	18,2	
Extractives & Mineral Processing	88	14,3	Health Care	24	3,9	Infrastructure	24	18,2	
Resource Transformation	84	13,6	Consumer Goods	12	1,9	Technology & Communications	20	15,2	
Technology & Communications	36	5,8	Renewable Resources & Alternative Energy	4	0,6	Resource Transformation	8	6,1	
			Total	616	100	Consumer Goods	4	3,0	
						Renewable Resources & Alternative Energy	4	3,0	
						Total	132	100	
Industry					Industry				
Commercial Banks	96	15,6	Household & Personal Products	8	1,3	Asset Management & Custody Activities	4	3,0	
Electric Utilities & Power Generators	84	13,6	Oil & Gas – Refining & Marketing	8	1,3	Chemicals	8	6,1	
Insurance	32	5,2	Processed Foods	8	1,3	Commercial Banks	20	15,2	
Chemicals	44	7,1	Software & IT Services	8	1,3	Construction Materials	12	9,1	
Oil & Gas – Exploration & Production	28	4,5	Processed Foods	4	0,6	Electric Utilities & Power Generators	12	9,1	
Electrical & Electronic Equipment	24	3,9	Aerospace & Defence	4	0,6	Electronic Manufacturing Services & Original Design Manufacturing	4	3,0	
Metals & Mining	24	3,9	Airlines	4	0,6	Iron & Steel Producers	4	3,0	
Real Estate	24	3,9	Alcoholic Beverages	4	0,6	Metals & Mining	16	12,1	
Biotechnology & Pharmaceuticals	20	3,2	Apparel, Accessories & Footwear	4	0,6	Multiline and Specialty Retailers & Distributors	4	3,0	
Investment Banking & Brokerage	20	3,2	Electronic Manufacturing Services	4	0,6				
Telecommunication Services	20	3,2	& Original Design Manufacturing	4	0,6	Oil & Gas – Exploration & Production	8	6,1	
Asset Management & Custody Activities	16	2,6	Gas Utilities & Distributors	4	0,6	Oil & Gas – Refining & Marketing	8	6,1	
Construction Materials	12	1,9	Hardware	4	0,6	Pulp & Paper Products	4	3,0	
Industrial Machinery & Goods	12	1,9	Marine Transportation	4	0,6	Real Estate	8	6,1	
Iron & Steel Producers	12	1,9	Medical Equipment & Supplies	4	0,6	Software & IT Services	4	3,0	
Rail Transportation	12	1,9	Non-Alcoholic Beverages	4	0,6	Telecommunication Services	12	9,1	
Automobiles	8	1,3	Oil & Gas – Services	4	0,6	Water Utilities & Services	4	3,0	
Engineering & Construction Services	8	1,3	Pulp & Paper Products	4	0,6				
Food Retailers & Distributors	8	1,3	Tobacco	4	0,6	Total	132	100	
			Water Utilities & Services	4	0,6				
			Total	616	100				

Table 4. Transition risk, physical risk, and opportunities

Developed					
Transition Risk		Physical Risk		Opportunities	
Policy & Legal	384	Acute	357	Resource Efficiency	185
Technology	298	Chronic	328	Energy Source	221
Market	301			Product and Services	216
Reputation	224			Market	182
Others	81			Resilience	123
				Others	80
Developing					
Transition Risk		Physical Risk		Opportunities	
Policy & Legal	85	Acute	90	Resource Efficiency	38
Technology	65	Chronic	76	Energy Source	41
Market	64			Product and Services	40
Reputation	62			Market	30
Others	11			Resilience	15
				Others	18

This table compares developed and developing countries across three main categories of climate-related disclosures: transition risks, physical risks, and opportunities. In the transition risk category, the highest-value sector in developed countries is Policy & Legal, with 384 companies, followed by technology with 298 companies and Market with a similar number. In contrast, in developing countries, Policy & Legal, with 85 companies, is also the highest category, although it is significantly lower than in developed countries. For physical risks, developed countries are more exposed to Acute risks, with 357 companies facing short-term

challenges, whereas developing countries tend to face fewer Acute risks, with 90 companies. Regarding opportunities, developed countries focus primarily on Resource Efficiency (185 companies) and Energy Source (221 companies). In developing countries, opportunities such as Resource Efficiency (38 companies), Energy Source (41 companies), and Product and Services (40 companies) are more prioritized. Companies that fully disclose (4 indicators for transition risks, 2 for physical risks, and 5 for opportunities) exhibit higher transparency regarding climate risks. In developed countries, 171 companies fully disclose transition risks, 315 companies for physical risks, and 59 companies for opportunities. Meanwhile, in developing countries, 54 companies fully disclose transition risks, 72 companies for physical risks, and 7 companies for opportunities.

Based on these disclosures, it can be concluded that developed countries are generally more prepared and open in addressing climate change challenges, both in terms of transition risks, physical risks, and related opportunities. It is reflected in the significantly higher number of companies that fully disclose information compared to developing countries. Developed countries demonstrate a higher commitment to planning mitigation and adaptation measures for climate change, in terms of policies, technologies, and markets. On the other hand, developing countries, although facing greater challenges related to resource limitations and capacity constraints, still make significant efforts in responding to climate change by disclosing opportunities and risks. Companies in developing countries tend to face greater challenges in securing resources, developing technological capacity, and formulating comprehensive climate policies. It is reflected in the smaller number of companies that fully disclose information compared to those in developed countries. Nonetheless, sectors such as Resource Efficiency and Energy Source are gaining greater attention in developing countries, indicating an increasing awareness of the importance of adapting to climate change and identifying the opportunities it presents. Therefore, developing countries require more support in terms of capacity, both from the public and private sectors, to strengthen their disclosures and responses to climate change.

Table 5. Distribution of Temperature Limit, Time Horizon, and References of Transition and Physical Risk

	Developed	Developing
Temperature Limit	1.5°C; 1.6°C; 1.7°C; 1.8°C; 1.9°C; 2°C; 2.4°C; 2.5°C; 2.6°C; 2.7°C; 3°C; 3.1°C; 3.2°C; 3.3°C; 3.5°C; 3.6°C; 3.7°C; 4°C; 4.1°C; 4.3°C; 4.4°C; 4.5°C; 5°C; >2°C; >3°C; >4°C; <1.5°C; <2°C; <3°C; Below 2°C	0; 0.3-1.7°C; 1.1-2.6°C; 1.3°C-2.4°C; 1.4°C; 1.5°C; 1.5°C-2°C; 1.5°C-4°C; 1.6°C-2°C; 1.7-3.2°C; 2°C; 3°C; 2°C-4°C; 3.1°C-4°C; 4.3°C; 4.4°C; <1.5°C; >1.5°C-<2°C; <2°C; >3°C; 2.5°C-3.5°C; 2°C-3°C; >4°C
Time Horizon	2020-2030; 2021; 2021-2030; 2025; 2025-2050; 2025;2030;2050; 2026-2030;2050; 2030; 2030-2040; 2030-2050; 2030-2051; 2030-2100; 2030;2039;2050; 2030;2050; 2030;2100; 2030;2040; 2030;2040;2050; 2030;2050; 2030;2050;2090; 2030-2050; 2034; 2034;2050; 2035; 2035;2045;2055;2050; 2035;2050; 2040; 2040;2050; 2040;2060;2100; 2040;2100; 2041-2060; 2041-2060;2081-2100; 2050; 2050-2075; 2050;2100; 2051; 2070; 2070;2080; 2100; 2100;2050; 2100;2100; 2100;2100;2050	2030; 2040; 2050; 2060; 2070; 2100
Reference of Transition Risk	IEA Net-Zero 2050; IEA Stated Policies Scenario; IEA Sustainable Development Scenario; IEA 450; IEA APS; IEA NZE; IEA NZE 2050; IEA SDS; IEA STEPS; IEA WEO; IEA NPS; IEA CPS; IEA SPS; IHS Autonomy; REMIND; REMIND NGFS Orderly; REMIND NGFS Disorderly; Integrated Assessment Models (IAMs); Business As Usual; CBES; Climate Scenario; Hot House World and 2°C Orderly Transition; Bloomberg New Energy Finance; S&P Global Commodity Insights; Wood Mackenzie Energy Transition; IPCC AR5 RCP8.5; IPCC RCP 1.9; IPCC RCP 2.6; IPCC RCP 4.5; IPCC RCP 6.0; IPCC RCP 8.5; IPCC SSP1-1.9; IPCC SSP1-2.6; IPCC SSP2-4.5; IPCC SSP3-7.0; IPCC SSP5-8.5; IPCC SR15; NGFS; NGFS Net Zero 2050; NGFS Below 2°C; NGFS Orderly; NGFS Disorderly; NGFS Divergent Net Zero; NGFS Delayed Transition; NGFS Controlled; OSFI; CSIRO; AEMO; SBTi; SBTi 1.5°C; WB2C; Net Zero Pathway 2035; Uniper's baseline assumptions; New Policies; Current Policies; Orderly Transition ("Net Zero 2050"); Internal Scenario; Internal Scenario Energy; Internal Scenario Climate Change; Internal Scenario Technology & Innovation; Internal Scenario Early Policy Action; Internal Scenario National Targets; Internal Scenario Probability-weighted; Internal Scenario Supply and Value Chain; S&P CCA; Bank of England Climate Stress Test; Social Cost of Carbon; Accelerated Transition.	ETP B2DS; IPCC 1.5-degree scenarios; IEA 2DS; IEA B2DS; IEA NPS; IEA CPS; IEA APS; IEA NZE; IEA NZE 2050; IEA SDS; IEA STEPS; IPCC SSP1-1.9; IPCC SSP1-2.6; IPCC SSP2-4.5; IPCC SSP3-7.0; NGFS Current Policies; NGFS NDCCS; NGFS Disorderly; NGFS Orderly; NGFS Net Zero 2050; REMIND_MAgPIE; Internal Scenario; Internal SBTi; SBTi; PRB; NZBA; GFAS; Wood Mackenzie Energy Transition.
Reference of Physical Risk	IPCC_RCP 1.9; IPCC_RCP 2.6; IPCC_RCP 4.5; IPCC_RCP 6.0; IPCC_RCP 7.0; IPCC_RCP 8.5; IPCC_SSP1-1.9; IPCC_SSP1-2.6; IPCC_SSP2-4.5; IPCC_SSP5-8.5; IPCC_AR5 RCP8.5; IPCC_SR1.5; IPCC_SSP1.1.9; IPCC_SSP1.6; IPCC_RCP 2.6; IPCC_RCP 4.5; IPCC_RCP 8.5; IPCC_RCP4.5 and RCP8.5; ISO 31000; Internal scenario; Net Zero 2050; Current Policies; RCP 2.6; RCP 4.5; RCP 6.0; RCP 8.5; SSP 5-8.5; SSP3-7.0; SSP2-3.5; SSP1-2.6; SSP2-4.5; SSP5-RCP8.5; NGFS; IEA SDS; IEA STEPS; CSIRO	IPCC; IPCC_RCP; IPCC_RCP 1.9; IPCC_RCP 2.6; IPCC_RCP 4.5; IPCC_RCP 6.0; IPCC_RCP 7.0; IPCC_RCP 8.5; IPCC_SSP 1; IPCC_SSP 2; IPCC_SSP 5; IPCC_SSP1-2.6; IPCC_SSP2-4.5; IPCC_SSP5-8.5; Internal scenario

Table 5 shows the variation in scenarios used by companies to plan for transition risks and physical risks related to climate change, focusing on three main components: temperature limits, time horizons, and references for transition and physical risks. Temperature limits refer to the global temperature constraints set in the climate change scenarios used by companies. In this case, companies in developed countries tend to choose higher temperature limits, with many adopting temperature limits between 1.5°C and 3°C. In comparison, companies in developing countries are more likely to choose lower temperature limits, such as 0°C to 2°C, indicating a sharper focus on efforts to control global warming.

The differences in the choice of temperature limits between companies in developed and developing countries can be explained by several factors. Developed countries typically have stronger infrastructure and more resources to support the transition to reduced carbon emissions. With advanced technology, mature policies, and greater financial capacity, companies in developed countries are better able to forecast and adopt higher temperature limits, such as 1.5°C to 3°C, while still focusing on long-term global targets. Meanwhile, companies in developing countries face greater challenges related to resource limitations and technological capacity, which leads them to favor lower temperature limits, such as 0°C to 2°C, to avoid more extreme climate change impacts that could directly affect them. Additionally, differences in policy frameworks and international commitments play a role: developed countries are more involved in international agreements like the Paris Agreement, which aims to limit global warming to 1.5°C, while developing countries prioritize actions to mitigate the risks of climate change in the short term. These

differences reflect variations in capacity and priorities between developed and developing countries in addressing climate change challenges, with developed countries being more flexible in setting higher temperature limits. In comparison, developing countries are more cautious in choosing stricter temperature limits.

The results for the time horizon show that companies in developed countries generally set longer time horizons in their planning, with many choosing a timeframe between 2020 and 2050 and even extending it to 2100. It suggests that companies in developed countries tend to prepare long-term strategies to address climate change. In contrast, companies in developing countries focus more on shorter periods, such as 2020 to 2030 or 2030 to 2050, suggesting they may still be in the planning and adaptation stage. However, the longer the time horizon used in planning, the greater the potential risk of delayed action. It is supported by research (Rogelj et al., 2019), which states that various organizations have developed 2°C scenarios, but these often focus on 2100 targets, potentially encouraging delayed action. To address this, a new scenario framework focusing on capping peak warming has been proposed (Rogelj et al., 2019).

Companies in developed countries more frequently refer to scenarios and models, such as the IEA Net-Zero 2050, the IEA SDS, and the IPCC RCP, for planning transition risks related to climate change. In developing countries, although similar references exist, reliance is placed on more specific scenarios, such as ETP B2DS, IPCC 1.5-degree scenarios, and REMIND NGFS, which reflect faster adaptation to globally relevant scenarios in their respective contexts. For physical risks, both developed and developing countries refer to similar scenarios, such as IPCC RCP 4.5 and IPCC RCP 2.6. However, companies in developing countries tend to focus more on acute physical risks, which are more relevant to conditions that may affect them more quickly.

In disclosing climate scenario analysis, companies refer to various global and national references to assess climate-related risks and opportunities and ensure transparency in their reporting. One of the main frameworks used is the TCFD, which recommends integrating climate scenarios into business strategies to assess resilience to various climate change scenarios. The Network for Greening the Financial System (NGFS) provides transition and physical scenarios used by central banks and financial institutions to assess the impact of climate change on financial stability. Additionally, the Carbon Disclosure Project (CDP) platform is used to report companies' climate strategies, while the Science Based Targets initiative (SBTi) helps companies set science-based emissions-reduction targets. The Net Zero Emissions (NZE) Framework helps companies design pathways toward net-zero emissions. Business as Usual (BAU) is used as a baseline in analysis, while the IPCC provides global data-based scientific scenarios that are frequently used in climate change impact modeling.

CONCLUSION

This study highlights the significant disparities in the adoption and quality of climate scenario analysis between developed and developing countries, particularly in the context of the mandatory implementation of IFRS S1 and S2. While developed countries have made substantial progress in integrating climate risk disclosures into their reporting frameworks, driven by stronger regulatory environments, investor pressure, and technological capacity, developing countries, such as Indonesia, still face considerable challenges. These challenges include gaps in regulatory readiness, limited resources, and a lack of expertise in climate reporting. As a result, the quality and comprehensiveness of climate scenario analysis in developing countries lag, creating a gap that impedes global efforts to mitigate climate change. The findings emphasize the need for enhanced capacity-building, regulatory harmonization, and cross-border collaboration to support the timely adoption of climate-related disclosure standards in developing economies. This research serves as a foundation for improving transparency and accountability in climate reporting, providing policymakers, regulators, investors, and companies with valuable insights to bridge the climate reporting gap between developed and developing nations.

However, this study also has limitations, primarily because the data are based on TCFD disclosures from 2020 to 2023. The period analyzed is still before the mandatory adoption of IFRS S1 and S2, which begins in 2024. Thus, the findings may not fully capture the impact of IFRS implementation on climate scenario disclosures. Future research can examine companies' disclosures once IFRS standards are fully implemented, providing a more comprehensive analysis of how the mandatory reporting requirements influence the quality and transparency of climate-related disclosures across different economies.

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