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WHAT DRIVES CORPORATE WATER DISCLOSURE? THE ROLE OF BOARD COMPOSITION IN BRAZIL AND INDIA

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1. INTRODUCTION

Water is the cradle of life on our planet. It is a natural resource considered a basic need for life. Water is vital and indispensable in the survival and growth of all humans and other creatures living on Earth (Khuong et al., 2022; Zhang et al., 2021). However, water is often poorly understood and protected compared to other natural resources (Gibassier, 2018; Wicaksono & Setiawan, 2022)

Once water and life go hand in hand, in modern industries, no industrial sector operates without water. Every industry is directly or indirectly related to this natural resource (Liu et al., 2021). Additionally, with the continuous expansion of the urban scale, the rapid growth of aggregate economic volume, the dramatic development of the urban population, and climate change, the public need for water resources has increased exponentially (Hou et al., 2021).

Economic growth has put enormous pressure on the Earth's water resources (Z. Zhou et al., 2018). Due to this exponential water demand, it has been forecasted that water scarcity can significantly affect the sustainable development of human society shortly (Zeng & Chen, 2019). To overcome this scenario, the United Nations' Sustainable Development Goals (SDGs) provide an ambitious set of targets for improving environmental sustainability, economic development, social cohesion, and human development by 2030 (UN Water, 2023).

To meet these goals, new improvements in how water resources are utilized, managed, and protected have been proposed (Northey et al., 2019). Corporate water information disclosure is a new hot topic (Liu et al., 2021; Z. Zhou et al., 2018). Water information disclosure implies that companies report information related to their water resource management status to stakeholders, including how to implement water resource management strategies and their effects on other businesses (CDP, 2022).

In such a manner, the board of directors is responsible for the company's strategic decision-making considering various stakeholders' interests, which are directly affected by the members' skills, backgrounds, and beliefs (Peng et al., 2023). This means corporate water management depends on the company's corporate governance in strategic decision-making (Kleinman et al., 2017).

Existing studies adopt the board composition characteristics as measurements of corporate governance to investigate the influence on water disclosure (Peng et al., 2023). These previous studies have shown that water information with vital institutional investors is a strategic tool (Zhang et al., 2021). However, the investigation of the relationship between board characteristics and corporate water disclosure remains few (Cantele, 2018; Hewawithana et al., 2021; Khuong et al., 2022; Peng et al., 2023; Sandhu et al., 2018; Wicaksono & Setiawan, 2022; Z. Zhou et al., 2018). Additionally, studies point out that the future of business depends on the sustainability of water resources (Botha, 2022; Burritt et al., 2016; Gibassier, 2018; Latiff, 2022; Talbot & Barbat, 2020).

As the current exploration of water information disclosure remains in its infancy, and there needs to be more research on water performance, this research aims to examine the effect of board composition on corporate water disclosure. More specifically, we investigated whether the board of directors, gender diversity, and board independence positively affect corporate water disclosure. Our analysis proceeds in several steps. Specifically, tests were performed using different methods: regression of panel data with fixed effects and regression using the Generalized Method of Moments (GMM). Our study analyzes the phenomenon using a sample of 668 companies in Brazil and India.

An essential aspect of water information is the provision of contextual water information (Hewawithana et al., 2021; Peng et al., 2023). Brazil and India are countries with remarkable similarities. Both countries have a sizeable territorial extension, are rich in human resources, have large and robust technology parks, and have great potential for sustainable business. Additionally, both economies are developing and are part of the BRICS, countries with great potential and growth today. According to Haffner and Monteiro (2011), India and Brazil have characteristics that bring them together, such as their history of colonialism. Both were colonized for a long time, and to this fact, they owe a large part of the characteristics they have today. Furthermore, Brazil and India need help with issues that make them complementary markets rather than competitors.

This paper has several contributions. First, it contributes to water disclosure research. Second, is the first research to provide a quantitative analysis of the drivers of water disclosure in two emerging markets, Brazil and India. Third, it contributes by showing that larger boards' gender diversity and board independence encourage implementing practices to increase water disclosure.

This study proceeds according to the following structure. In Section 2, we discuss the Stakeholders Theory and the hypothesis development. Section 3 describes the research design, sample selection, variable definition, and model setting. In Section 4, we present our empirical results. Section 5 outlines the discussion analyses, and Section 6 concludes with theoretical contributions, policy implications, and a discussion of the research limitations and future research directions.

2. LITERATURE REVIEW

2.1 Stakeholder Theory

The term “stakeholder” first appeared in 1963, referring to the only group a company needs to answer to (Yu et al., 2020). In this context, Stakeholder Theory holds that companies must create a good relationship with stakeholders by meeting their demands and treating them best (Gilsbach et al., 2022; Wicaksono & Setiawan, 2022).

In other words, stakeholder theory explains how groups or individuals (stakeholders) can influence an organization or have been affected (Peng et al., 2023). Thus, under this theory, organizational behavior can be predicted by the varied stakeholder relationships and their influence on firm decisions (Wicaksono & Setiawan, 2023; Z. Zhou et al., 2018).

Past studies affirm that organizations only pay attention to their most influential stakeholders (Peng et al., 2023; Wicaksono & Setiawan, 2023). However, corporations need to attend to various stakeholders’ interests (Adhariani, 2021) because the success and survival of organizations depend on satisfying their demands (Wicaksono & Setiawan, 2023). By Wicaksono and Setiawan (2023), stakeholders have immense power to influence management decisions.

Two distinct branches of stakeholder theory represent different ways organizations can respond to stakeholder concerns. One is the normative or righteous branch that advocates that all stakeholders be given equal consideration and that their references be incorporated into corporate decision-making and information provided regardless of whether it is requested or used (Burritt et al., 2016). The other, the executive branch of stakeholder theory, suggests the importance of managers to stakeholder-related decisions and that managers will prioritize stakeholder interests according to each group's power and influence over the organization (Burritt et al., 2016).

According to Wicaksono and Setiawan (2022), the organization’s management is expected to take on activities that stakeholders expect and report those activities to stakeholders.

Therefore, stakeholder theory has been widely used in corporate environmental or related disclosure studies. Indeed, both normative and managerial stakeholder theory views stress the importance of sufficient disclosure of internal information to stakeholders (Yu et al., 2020).

Recently, scholars have argued that stakeholders are starting to pay attention to a company's water responsibilities (Wicaksono & Setiawan, 2022); once companies use a large amount of water and contribute to the water crisis, stakeholders will start to influence companies to take action and be responsible for the negative impacts of water usage (Kumar & Singh, 2022; Wicaksono & Setiawan, 2022).

Notwithstanding, also as pointed out earlier, with global climate change and population growth placing many stressed water sources under even more pressure, corporations in all countries can no longer continue with a "business as usual" mentality (Burritt et al., 2016). In this way, there is increased interest from stakeholders, including investors, media, and customers, for corporations to include evidence of corporate water disclosure (Fialho et al., 2020; Morris & Mcguinness, 2021).

For Yu et al. (2020), mainly investors are paying attention to this kind of report expressing a higher willingness to invest more in firms dedicated to water disclosure. Thus, investors constantly seek more than just financial information in annual reports to ensure their investments remain profitable (Latiff, 2022; Signori & Bodino, 2013; Zhang et al., 2021).

In such a manner, water information disclosure refers to companies reporting information related to the current situation of water resource management to stakeholders, i.e., suppliers, consumers, communities, employees, media, investors, governments, non-governmental organizations, etc.), including the implementation of a water resource management strategy and its impact on other businesses (Zhou et al., 2018).

It is also important to note that companies that actively implement water information disclosure can increase the information content in the marketplace, reduce the asymmetry between internal and external information (Z. Zhou et al., 2018), display enhanced social attention, and improve corporate's transparency (Adhariani, 2021; Botha, 2022; Linneman et al., 2015; Liu et al., 2021; Wicaksono & Setiawan, 2022; Zeng & Chen, 2019; Z. Zhou et al., 2018). This transparency improves the ability of stakeholders to evaluate a company's sustainability, thus fostering greater corporate accountability and increasing stakeholders' trust, confidence, and goodwill (Signori & Bodino, 2013).

Thus, stakeholder theory has mainly been adopted by scholars to explain the effects of stakeholders on disclosure practices (Gilsbach et al., 2022; Liu et al., 2021). Indeed, stakeholder theory serves as the basis for examining Corporate Social Responsibility (CSR), as demonstrated by several scholars (Kleinman et al., 2017; Liu et al., 2021; Q. Zhou et al., 2021).

Chart I summarizes the existing literature related to water disclosure. Analyzing Chart I, we note that the theme around water disclosure is recent. Chart I also focuses on quantitative approaches and studies that used an econometric approach. It allows us to argue that our study proposes original research hypotheses.

Chart I – Previous studies related to water disclosure

Article	Context / Objective	Variables
2016 – Burritt et al. – Drivers of corporate water-related disclosure: evidence from Japan	The purpose of the paper is to investigate such drivers of water disclosure by listed companies in Japan and to understand whether exposure to general stakeholder pressure is affecting business practice in a positive way	• Water-related disclosure (dependent) • Water risk sensitivity of the industry in which an organization operates • Media exposure • Ownership concentration • International listing • Profitability
2017 – Zhou et al. – The impact of water information disclosure on the cost of capital: an empirical study of China's capital market	The study seeks to understand the underlying relationship between water information disclosure and the cost of capital in Chinese high-water-risk firms	• Corporate water information disclosure (dependent) • Enterprise capital cost

		• Official political connections • Representative political connections
2018 – Zhou et al. – Does water disclosure cause a rise in corporate risk-taking? Evidence from Chinese high water-risk industries	The study examines the impact of water disclosure on corporate risk-taking and the moderating effect of organizational legitimacy in 334 listed companies in Chinese high water-risk industries and selects 2010 to 2015	• Corporate risk-taking (dependent) • Water disclosure • Organizational legitimacy
2019 – Zeng et al. – Water disclosure and firm risk: empirical evidence from highly water-sensitive industries in China	The article examines the relationship between water disclosure and firm risk of 334 Chinese listed firms operating in highly water-sensitive sectors during 2010-2015	• Water disclosure (dependent) • Firms' risk
2020 – Yu et al. – The drivers of corporate water disclosure in enhancing information transparency	The paper explores drivers of corporate water disclosure (CWD) from an aspect of accountability in US firms in 2016	• Corporate water disclosure (dependent) • Size • Profitability • Leverage • Blockholders' ratio • Famous index of capital market • Water-sensitive industry
2020 – Zhou et al. – Help or resistance? Product market competition and water information disclosure: evidence from China	The paper investigates the relationship between product market competition and firms' water information disclosure and how firms' ownership type can affect this relationship in China	• Water information disclosure (dependent) • Industry competition intensity • Enterprise market power
2021 – Liu et al. – Water disclosure and financial reporting quality for social changes: empirical evidence from China	The study discusses the correlation between water information disclosure and financial reporting quality, and determines whether financing constraints mediate the correlation in China	• Water disclosure • Financial reporting quality • Financial constraints
2021 – Zhang et al. – Mind the gap: is water disclosure a missing component of corporate social responsibility?	The article investigates the rationale behind and the factors contributing to corporate decisions to voluntarily disclose water information via the customer data platform (CDP) from 2010 to 2013	• Water disclosure program of the CDP (dependent) • Membership in a sector with high water consumption • Self-regulation • National environmental regulation • Being equal
2021 – Zhou et al. – Does China's river chief policy improve corporate water disclosure? A quasi-natural experimental	To explore the actual impact of water resources management, the study took China's River Chief Policy as an example, adopted the differences in different methods, and used a sample of highly water-sensitive listed companies (2010 – 2017)	• Water disclosure (dependent) • China's River Chief Policy (CRCP) • Corporations with a lower proportion of equity concentration • The lower the degree of marketization in the region where the corporation is located
2022 – Botha et al. – Water governance disclosure: the role of integrated reporting in the food, beverage, and tobacco industry	The purpose of the paper is to investigate current practices of water governance disclosure in the food, beverage, and tobacco industry and to determine whether the quality of disclosure has a positive association with integrated reporting	• Water-related disclosure on governance (dependent) • Integrated reporting • Environmental management systems strategies • Context in which firms operate • Firm's business model • Board-level oversight • Policies, commitments, and programmes
2022 – Khuong et al. – The effect of water disclosure on firm value in Vietnamese listed companies	The paper analyzes the impact of country disclosure on the firm value of listed companies in Viet Nam	• Water information (dependent) • Revenue growth • Age
2022 – Peng et al. – Board gender diversity, national culture, and water disclosure of multinational corporations	The study investigates the water disclosure of 150 multinational corporations from China, Japan, the U.K., and the U.S.	• Water disclosure (dependent) • Board gender diversity (BGD) • Interaction of high-power distance and BGD • The interaction of high individualism and BGD • The interaction of high masculinity and BGD • The interaction of high-uncertainty avoidance and BGD
2022 –Wicaksono and Setiawan – Water disclosure in the agriculture industry: does stakeholder influence matter?	The study presents an analysis of stakeholder influence on water-related disclosure in Agriculture from a sample of 195 companies registered in the OSIRIS database (2017-2019)	• Corporate water disclosure (dependent) • Government ownership • Foreign ownership • Creditor

		• International operation
2022 – Yu – Creating environmental sustainability: determining factors of water resources information disclosure among Chinese enterprises	The paper aims to use stakeholder theory and the guanxi perspective to examine the determining factors of water resources information disclosure among Chinese enterprises in the context of authoritarian and normative pressures	• Water resources information (dependent) • Having the state as the largest shareholder • Guanxi (relation connection) • Water-sensitive industries (WSI) • Coastal WSI firms • Non-coastal WSI firms

Source: Created by the authors (2023)

Next section, we will present our research hypotheses.

2.2 Hypotheses development

According to the literature, a larger board of directors can provide more knowledge, experience, and external links (Peng et al., 2023). A study by Yu (2020) found that size positively and significantly affects the disclosure of water resources information. They argue that larger firms have a stronger tendency to disclose water resource information to reduce their political costs. Also, Burritt et al. (2016) discovered that larger companies are more visible to the public; thus, it is more likely to attract interest from diverse stakeholder groups. This way, a more giant board of directors can improve an organization's water disclosure. Given that these previous studies found that a larger board positively affects corporate water disclosure, we propose our first research hypothesis:

H1: A larger board of directors has a positive effect on corporate water disclosure.

By Peng et al. (2023), academic attention on corporate water disclosure and the role of board gender diversity in corporate environmental responsibility has increased dramatically. Previous literature suggests that compared to males, females exhibit heightened generosity, social orientation, and higher ethical standards (Tao-Schuchardt & Kammerlander, 2023). Previous studies also affirm that women are more concerned with broader stakeholders' interests and demands. As a result, gender diversity enhances decision-making on environmental disclosure (Ali, 2020). Once previous studies found that board gender diversity positively affects corporate water disclosure, we have developed the following hypothesis:

H2: Greater board gender diversity has a positive effect on corporate water disclosure.

There is a consensus that independent boards increase the quality and reliability of corporate reports associated with stakeholders (Guerrero-Villegas et al., 2018; Pérez-Cornejo et al., 2019; Wan Mohammad & Wasiuzzaman, 2019). Existing studies pointed out that more independent directors mean more chances for managers to be inspired by higher levels of transparency, which affects the company's reputation and consequently waters corporate disclosure. A study conducted in India by Fahad and Rahman (2020) demonstrated that greater board independence improves company engagement with social and environmental issues. Similarly, Ghuslan et al. (2021) argued that independent directors are more probably to protect shareholders' interests. In other words, independent directors straighten relationships with employees, the community, and general stakeholders once they are closer to their interests. Finally, we proposed our last hypothesis:

H3: Greater board independence has a positive effect on corporate water disclosure.

3. RESEARCH DESIGN

3.1 Sample description

Our sample has 668 companies, and the data was collected from the Refinitiv Eikon database. We excluded companies from the financial sector since they have different accounting rules, which could bias our findings. Our study used observations from 102 companies headquartered in Brazil and 566 firms in India, covering 2016-2020. We chose this timeframe because, after the signing of the UN Global Compact in 2015, companies increased their engagement with environmental issues. 2020 was the year with the most recent data when we were collecting the data.

Table I presents the number of companies by sector and by country. As can be seen, our sample is divided into eight industry groups: basic materials, consumer cyclical, consumer non-cyclical, energy, healthcare, industrials, real estate, and utilities. In short, our sample represents a wide range of industries. The sectors with the greatest representation are basic materials, consumer cyclical, and industrials, with 23%, 22%, and 20%, respectively. On the other hand, the energy sector has the lowest representation in the sample.

Table I. Number of sample companies in each sector and country

TRBC Economic sector name	Brazil	India	Total	
	Frequency	Frequency	Frequency	Percent
Basic materials	12	144	156	0.234
Consumer cyclical	17	131	148	0.222
Consumer non-cyclical	13	52	65	0.097
Energy	7	17	24	0.036
Healthcare	6	56	62	0.093
Industrials	18	121	139	0.208
Real Estate	12	21	33	0.049
Utilities	17	24	41	0.061
Total	102	566	668	1.000

3.2 Variables' definitions and features

The dependent variable, corporate water disclosure, is labeled WATERDISC. This variable reflects the sum of the companies' actions regarding their conscientious use of water: policy water efficiency targets water efficiency, water recycled, and water technologies. Our variable differs from previous studies (Ben-Amar & Chelli, 2018; Wicaksono & Setiawan, 2022) because we selected less susceptible indicators to greenwash. For example, the study by Kleinman et al. (2017) examined disclosure through water withdrawal, consumption, reuse, and discharge. The authors of this study measure the amount of information disclosed rather than what the company did to mitigate its effects on water use.

Although Chen and Huang (2023) used an indicator less susceptible to greenwashing to measure water disclosure, the study considered only the reduction of water consumption. However, corporate water disclosure should include issues such as adopting water reuse technologies and introducing policies for efficient water use (Zhang et al., 2021).

To represent the board's composition, we selected three independent variables: board size, board gender, and board independence. According to Naciti (2019), board diversity in size, gender, nationality, and independence can provide companies with a competitive advantage and more excellent financial and social performance. More recently, de Abreu et al. (2023) showed

that the composition of the board (board size, board gender, and board independence) has a positive effect on the environmental innovation of companies based in Latin America.

Table II presents the description of all variables analyzed in our study.

Table II. Variables description

Variable	Description	Source
WATERDIS	Corporate Water Disclosure: This metric ranges from 0 (less disclosure) to 4 (greater disclosure). This variable is formed by the sum of 4 indicators: Policy Water Efficiency, Targets Water Efficiency, Water Recycled, and Water Technologies.	Refinitiv Eikon
BSIZE	Board Size: Total number of executive directors on the board of directors.	Refinitiv Eikon
BGENDER	Gender Diversity: Number of female directors/total number of directors on the board of directors.	Refinitiv Eikon
BINDEP	Board independence: Number of independent directors/total directors on the board of directors.	Refinitiv Eikon
ROA	Return on Assets: Net Income/Total Assets.	Refinitiv Eikon
FIRMSIZE	Company Size: Natural log of total assets.	Refinitiv Eikon
MKTCAP	Market Capitalization: refers to the total dollar market value of a company's outstanding shares.	Refinitiv Eikon
LEVERAGE	Leverage: Total Liabilities/Total Assets.	Refinitiv Eikon
GLOBALCOM	Adoption of the UN Global Compact: 1 = if the company adopts the Global Compact; 0 = otherwise.	Refinitiv Eikon
CSREPORT	Corporate Social Responsibility Report: 1 = if the company publishes an annual CSR report; 0 = otherwise.	Refinitiv Eikon

Drawing on past evidence, we consider some variables that may affect corporate water disclosure. We examined the effect of six control variables: return on assets, company size, market capitalization, leverage, and adoption of the UN Global Compact and Corporate Social Responsibility report. According to Chen and Huang (2023), companies with higher financial performance (ROA) can take more actions to reduce water use. Company size can affect water disclosure, as larger companies have more resources to track their impacts on the environment and report quality environmental information (Ben-Amar & Chelli, 2018; Wicaksono & Setiawan, 2022).

Companies with higher market capitalization tend to have a larger number of stakeholders who are interested not only in financial information but also in environmental issues, which includes water disclosure. According to previous studies (Chen & Huang, 2023; Zhang et al., 2021), leverage can be essential for greater investments in water reuse technologies. Previous studies (Fiechter et al., 2022; Haque & Ntim, 2018; Thorne et al., 2017) have shown that adopting the UN Global Compact and the annual disclosure of a sustainability report positively affect the environmental engagement of companies.

3.3 Econometric approach

To test our research hypotheses, we operationalize econometric models using panel data analysis with fixed effects. Panel data analysis is the most efficient type of regression to operationalize when the data has both cross-sectional and time-series dimensions (Naciti, 2019). We analyzed the effect of board composition on corporate water disclosure using the equation below:

$$WATERDIS_{it} = \beta_{it} + \beta_1 BSIZE_{it} + BGENDER_{it} + BINDEP_{it} + ROA_{it} + FIRMSIZE_{it} + MKTCAP_{it} + LEVERAGE_{it} + GLOBALCOM_{it} + CSREPORT_{it} + \theta_i + \varepsilon_{it}$$

Where: i represents the companies, and t represents the year. Furthermore, BSIZE, BGENDER, and BINDEP are our independent variables, and ROA, FIRMSIZE, MKTCAP, LEVERAGE, GLOBALCOM, and CSREPORT are the control variables of our models. For each of the models, we operationalized additional tests to give more validity to the findings, for example, variance inflation factor (VIF), Breusch-Pagan test, root-mean-square error (MSE), and Akaike information criterion (AIC).

Similarly, we estimate econometric models using dynamic panel data by the GMM method. According to Hair Jr. et al. (2019), the GMM method is consistent because it considers unobservable heterogeneity, considers endogeneity, and reduces model biases.

Our sample has companies from different sectors, so we conducted sensitivity analyses to examine our results' stability. For that, we operationalized econometric models considering only the environment-sensitive sectors since they suffer regulatory pressure differently from the other sectors. All analyzes were performed using STATA® software version 14.

4. RESULTS

Table III reports descriptive statistics for all variables used in the models. The mean value of corporate water disclosure is 1.27, i.e., 31.75%. Regarding the composition of the board, the data show that the size of the board has, on average, 9.55 directors. The company with the smallest board size has one director, and the company with the largest board size has 22 directors. On average, Brazilian and Indian companies have 15% female board participation. Our sample features companies with no women on the board, and one company has 55% female representation.

Table III. Summary of descriptive statistics

Variable	Observations	Mean	SD	Minimum	Maximum
WATERDIS	1394	1.27	0.93	0.00	4.00
BSIZE	1392	9.55	2.90	1.00	22.00
BGENDER	1390	15.33	9.86	0.00	54.55
BINDEP	1389	48.01	16.10	0.00	100.00
ROA	658	0.06	0.10	-0.67	0.86
FIRMSIZE	1388	9.28	0.68	7.29	11.36
MKTCAP	1389	9.33	0.65	7.08	11.29
LEVERAGE	1388	0.56	0.33	0.00	7.52
GLOBALCOM	1394	0.16	0.37	0.00	1.00
CSREPORT	1394	0.81	0.38	0.00	1.00

About 48% of the board members of an average company are independent. The average return on assets value is 0.06 out of a maximum of 0.86. The average firm size measured as the natural logarithm of the total assets is 9.28. The market capitalization variable averages 9.33, while leverage averages 0.56. In general, the financial variables indicate that the sample has companies of different sizes. 16% of companies adhere to the UN Global Compact, and 81% of the sample publish a corporate social responsibility report annually.

Table IV shows the pairwise correlations between the dependent and independent variables. Corporate water disclosure has a positive and significant correlation with board size,

board independence, ROA, board size, market capitalization, adoption of the UN global compact, and disclosure of a CSR report. The independent and control variables have low correlations with each other, which may indicate that multicollinearity is not a problem in our analyses.

Table IV. Pairwise correlation matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) WATERDIS	1.00								
(2) BSIZE	0.28***	1.00							
(3) BGENDER	-0.00	-0.07	1.00						
(4) BINDEP	0.06***	-0.04**	0.22***	1.00					
(5) ROA	0.12***	0.13***	0.02	-0.12***	1.00				
(6) FIRMSIZE	0.37***	0.33***	-0.20***	-0.16***	-0.00	1.00			
(7) MKTCAP	0.43***	0.37***	0.01	-0.05**	0.34	0.59***	1.00		
(8) LEVERAGE	-0.00	0.00	-0.13	-0.01	-0.48***	0.24***	-0.10***	1.00	
(9) GLOBALCOM	0.27***	0.16***	-0.12***	-0.07***	0.03	0.40***	0.21***	0.11***	1.00
(10) CSREPORT	0.41***	0.22***	0.04*	0.03	0.05	0.23***	0.33***	0.00	0.17***

***: <0.01; **:<0.05; *<0.10

In Table V, we present the findings of the econometric models built to test the hypotheses. In Model 1, we only explore the effect of control variables on corporate water disclosure to provide a baseline. In Models 2, 3, and 4, we add one independent variable at a time. Finally, in Model 5, we add all the variables.

Table V. Fixed-effects panel regression analysis

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
BSIZE		0.02***			0.02***
BGENDER			0.00		0.00
BINDEP				0.03**	0.00**
ROA	0.19	0.13	0.21	0.29	0.22
FIRMSIZE	0.19***	0.18***	0.20***	0.23***	0.22***
MKTCAP	0.24***	0.21***	0.23***	0.22***	0.19***
LEVERAGE	-0.22	-0.24	-0.22	-0.25*	-0.27*
GLOBALCOM	0.30***	0.29***	0.30***	0.29***	0.28***
CSREPORT	0.80***	0.76***	0.79***	0.79***	0.76***
Observations	655	655	655	655	655
R^2 within	0.2902	0.2968	0.2906	0.2947	0.3015
F test	43.89***	38.77***	37.63***	38.38***	30.75***
VIF	1.59	1.55	1.54	1.55	1.50
Breusch-Pagan test	3.88	3.68	3.94	2.41	2.10
Root MSE	0.80	0.80	0.80	0.80	0.80
AIC	1580.16	1577.84	1581.62	1577.80	1577.15

Note: ***p<0.01. **p<0.05. *p<0.10.

Our findings show that board size positively affects corporate water disclosure, which confirms our hypothesis 1. Boards with more directors tend to have a more conscious use of water. Gender diversity was not significant in any model. The results show that board

independence has a positive effect on corporate water disclosure, indicating that firms that encourage the participation of directors without affiliation with the company have greater water disclosure. This is consistent with hypothesis 3.

Regarding control variables, the findings suggest that company size and market capitalization positively affect corporate water disclosure. This may indicate that larger companies have more environmental responsibility because they have more stakeholders interested not only in financial information but also in information such as environmental risks and water disclosure. Additionally, the company's adherence to the Global Compact and the disclosure of a CSR report motivate the company to have greater water disclosure. In fact, companies that sign the Global Compact and prepare a report with non-financial information show society that they are more engaged with environmental causes.

To avoid endogeneity in our models and give the findings greater validity, we performed dynamic panels using the GMM method. The results are shown in Table VI.

Table VI. Multivariate Analysis Results of the GMM

Variable	Model 6	Model 7	Model 8	Model 9	Model 10
BSIZE		0.02**			0.02**
BGENDER			0.00		0.00
BINDEP				0.00**	0.00**
ROA	0.15	0.10	0.17	0.25	0.20
FIRMSIZE	0.19***	0.18***	0.20***	0.23***	0.22***
MKTCAP	0.24***	0.21***	0.23***	0.22***	0.18***
LEVERAGE	-0.23	-0.25*	-0.22	-0.26*	-0.28*
GLOBALCOM	0.29***	0.28***	0.29***	0.28***	0.27***
CSREPORT	0.81***	0.79***	0.81***	0.81***	0.78***
Observations	655	655	655	655	655
R^2	0.2929	0.2976	0.2935	0.2976	0.3026
Wald X^2 test	360.86***	368.63***	373.82***	362.42***	377.24***
Root MSE	0.7998	0.79717	0.79947	0.79714	0.79432
Endogenous regressors	No	No	No	No	No

Note: ***p<0.01. **p<0.05. *p<0.10.

The signs of the independent variables remain, indicating that our models are stable. Our findings show that boards with a greater number of directors and, therefore with a greater diversity of backgrounds and experiences tend to have greater corporate disclosure of water. Greater board independence positively influences water disclosure. In Model 10, when all variables were entered together, the findings confirm that the size of the board and its independence play an essential role in water disclosure by Brazilian and Indian companies.

The results concerning control variables in Table 6 are as expected. Consistent with the prior literature, companies with greater financial performance engage more with corporate water disclosure. This means financially healthy companies have more resources to devote to environmental issues. Additionally, the company joining the Global Compact and having a CSR report are factors that encourage more ethical behavior about the use of water.

The study by Zeng et al. (2020) states that some sectors are more environmentally sensitive than others. The authors state that as the energy, basic material, utilities, and industrial sectors use more water in their operations, it is more likely that these sectors will behave more responsibly. Therefore, we performed a sensitivity analysis, which analyzed only the role of

board composition on water disclosure in environmentally sensitive sectors. Table VII presents the sensitivity analysis results.

Table VII. Fixed-effects panel regression analysis (analyzing the environmentally sensitive sectors)

Variables	Model 11	Model 12	Model 13	Model 14	Model 15
BSIZE		0.03**			0.03***
BGENDER			0.00		0.00
BINDEP				0.00**	0.00**
ROA	0.14	0.13	0.14	0.20	0.20
FIRMSIZE	0.13	0.12	0.14	0.15	0.14
MKTCAP	0.40***	0.37***	0.39***	0.38***	0.34***
LEVERAGE	-0.37*	-0.38*	-0.37*	-0.39*	-0.40*
GLOBALCOM	0.30***	0.27***	0.29***	0.29***	0.27***
CSREPORT	1.15***	1.12***	1.15***	1.17***	1.13***
Observations	357	357	357	357	357
R^2 within	0.2956	0.3064	0.2961	0.2967	0.3083
F test	24.20***	21.78***	20.73***	20.79***	16.99***
VIF	1.66	1.59	1.60	1.62	1.54
Breusch-Pagan test	2.00	1.22	1.79	1.31	0.43
Root MSE	0.85	0.85	0.85	0.85	0.85
AIC	910.38	908.77	911.88	911.41	911.07

Note: ***p<0.01. **p<0.05. *p<0.10.

Our evidence confirms that board gender and independence positively affect water disclosure in the basic materials, energy, industrial and utilities sectors. In these sectors, the board's composition is also relevant for companies to have strategies to mitigate the impacts of their water use. Consistent with previous analyses, the variables of market capitalization, adoption of the Global Compact, and disclosure of a CSR report maintained their positive effect on water disclosure.

However, in these new analyses, company size lost significance. This means that the company's size is not decisive for it to be more engaged with water disclosure. This statement is valid for environmentally sensitive sectors. Additionally, the findings allow us to identify that leverage has a negative effect on corporate water disclosure.

5. DISCUSSIONS AND IMPLICATIONS

Corporate water management is becoming an increasingly important topic to the business community-society and academia (Burritt et al., 2016; Khuong et al., 2022; Liu et al., 2021). In recent years, as corporate shareholders, government departments, consumers, and other stakeholders have started to demonstrate a strong interest in corporate water management and information disclosure, companies have had to fulfill the needs of these groups for water resources (Liu et al., 2021).

Our study empirically found that greater board gender and independence positively affect corporate water disclosure, supporting H2 and H3, respectively. Numerous studies have contended that board diversity affects corporate reputation and corporate social responsibility, among others (Ghuslan et al., 2021; Jarboui et al., 2023), and it is one of the most crucial elements of successful board composition (Guerrero-Villegas et al., 2018).

In such a manner, our findings are in line with previous studies. In a research conducted by Peng et al. (2023), they found that female board members' moral characteristics caused by gender differences are the key to promoting the board's abilities of stakeholders' water issue detection. In this same line, Ali (2020) affirms that women are more concerned with broader stakeholders' interests and demands. Consequently, it is crucial to save that diversity includes gender, religion, and sexuality, among others, and it enhances decision-making on environmental disclosure.

Concerning board independence, the literature points out that independence allows members and directors to straighten relationships with employees, the community, and general stakeholders. As shown in our results, independence positively affects corporate water disclosure. It is also proved by Fahad and Rahman (2020) and Ghuslan et al., 2021). They found that board independence improves company engagement with social and environmental issues and, consequently water disclosure information.

Previous studies on corporate water disclosure confirmed the positive influence of company size (Burritt et al., 2016; Yu et al., 2020). In general, "size" generally affects the workforce, human rights, community, and corporate reputation, for example (Wang et al., 2022). However, in our analysis, the size of the board directors lost significance. In other words, the company's size is not decisive for it to be more engaged with water disclosure. It contradicts a study by Burritt et al. (2016), in which large firms experience greater scrutiny from external stakeholders, which may lead management to disclose more information about water to dispel negative attention and reduce potential political costs.

Our study is in accordance with previous studies that have shown business water management is an essential component of corporate sustainability (Hazelton, 2013; Hewawithana et al., 2021; Khuong et al., 2022) and is an essential firm-level business ethics issue (Zeng et al., 2020). Also, disclosure can build employment credibility with employees concerned about the environment and water issues (Burritt et al., 2016). Further, the stakeholder theory shows that pressure from external stakeholders is an essential driver of corporate water behavior (Zhou et al., 2021).

The results provided by our analysis have noted implications. This study demonstrates how board diversity and independence affect corporate water disclosure and enriches the academic sphere related to corporate water disclosure by adopting variables never used before in econometric approaches. In this way, this research helps to fill the gaps in the literature on the impact of board characteristics on water information. Moreover, this study contributes to developing the Stakeholder Theory that anchored our analysis in two emerging markets, Brazil and India.

In addition, this study has significant implications for managers, stakeholders, and policy-makers. By improving board diversity and independence, managers will increase the company water disclosure and enhance the capacity of the business in sharing social and environmental information. This can be used by investors and regulatory authorities as one criterion for measuring the quality of financial reports, which can effectively decrease the cost of information screening (Liu et al., 2021).

Finally, public and regulatory authorities should hold a positive attitude toward companies that report on water information, give them more attention and support, and stimulate companies to disclose more in their environmental reports. Moreover, policymakers have the role of promoting consciousness of water saving and consciousness of environmental responsibility together with companies (Hou et al., 2020).

6. CONCLUSIONS

This paper aimed to examine the effect of board composition on corporate water disclosure. We look specifically at how board size, gender diversity, and independence affect water disclosure. We investigated a sample of 668 companies from 8 sectors based in Brazil and India. This paper is the first to provide a quantitative analysis of the drivers of water disclosure in two emerging markets. Our findings showed that in larger councils, companies are more engaged with water disclosure. Furthermore, on more independent boards, companies are more likely to behave more conscientiously about water use.

Our additional results confirm previous studies by showing that financial performance positively affects corporate water disclosure. Companies with greater availability of financial capital, in general, have more stakeholders and greater financial resources to implement water reuse policies and strategies. Additionally, the adoption of the UN Global Compact and the disclosure of a CSR report are attitudes that can lead the organization to have greater water disclosure. These results have theoretical, managerial, and governmental implications, as presented in the discussion section.

Our results are not free from limitations. First, the variable that measures water disclosure could include more water performance indicators if companies had provided other information. Second, the board's composition is restricted to features available in the Refinitiv Eikon database. Third, we analyze only two major emerging economies in a limited time frame: 2016-2020.

Therefore, future studies should address issues that still need to be resolved by our paper. New research can look at other emerging economies such as China, Russia, and South Africa, as well as we encourage studies on water disclosure in developed countries as well. Corporate disclosure of water is still an underdeveloped field, so research is needed to find determining factors at both the organizational and institutional levels.

REFERENCES

Adhariani, D. (2021). *The Shape of Water : Analysis of Corporate Water Disclosure in Indonesia*. 121–134.

Ali, I. M. (2020). *Water Disclosure And Financial Performance: The Case Of Cdp Water A-List Companies*. 259–267. https://doi.org/10.15405/epsbs.2020.12.05.27

Ben-Amar, W., & Chelli, M. (2018). What drives voluntary corporate water disclosures? The effect of country-level institutions. *Business Strategy and the Environment*, *27*(8), 1609–1622. https://doi.org/10.1002/bse.2227

Botha, M. (2022). *Water governance disclosure : the role of integrated reporting in the food , beverage and tobacco industry*. *104675*. https://doi.org/10.1108/MEDAR-09-2020-1006

Burritt, R. L., Christ, K. L., & Omori, A. (2016). Drivers of corporate water-related disclosure: Evidence from Japan. *Journal of Cleaner Production*, *129*, 65–74. https://doi.org/10.1016/j.jclepro.2016.04.119

Cantele, S. (2018). *A New Framework for Assessing the Sustainability Reporting Disclosure of Water Utilities*. 1–12. https://doi.org/10.3390/su10020433

CDP. (2022). *CDP Global Water Report 2022*. https://cdn.cdp.net/cdp-production/cms/reports/documents/000/006/925/original/CDP_Water_Global_Report_2022_Web.pdf?1679328280

Chen, Y., & Huang, M. (2023). Water usage reduction and <scp>CSR</scp> committees: Taiwan evidence. *Corporate Social Responsibility and Environmental Management*, *30*(3), 1070–1081. https://doi.org/10.1002/csr.2404

de Abreu, M. C. S., Soares, R. A., Daniel-Vasconcelos, V., & Crisóstomo, V. L. (2023). Does board diversity encourage an environmental policy focused on resource use, emission reduction and innovation? The case of companies in Latin America. *Corporate Social Responsibility and Environmental Management*, *30*(3), 1161–1176. https://doi.org/10.1002/csr.2411

Fahad, P., & Rahman, P. M. (2020). Impact of corporate governance on CSR disclosure. *International Journal of Disclosure and Governance*, *17*(2–3), 155–167. https://doi.org/10.1057/s41310-020-00082-1

Fialho, A., Morais, A., & Costa, R. P. (2020). *Impression management strategies and water disclosures – the case of CDP A-list*. https://doi.org/10.1108/MEDAR-08-2019-0542

Fiechter, P., Hitz, J.-M., & Lehmann, N. (2022). Real Effects of a Widespread CSR Reporting Mandate: Evidence from the European Union's CSR Directive. *Journal of Accounting Research*, *60*(4), 1499–1549. https://doi.org/10.1111/1475-679X.12424

Ghuslan, M. I., Jaffar, R., Mohd Saleh, N., & Yaacob, M. H. (2021). Corporate Governance and Corporate Reputation: The Role of Environmental and Social Reporting Quality. *Sustainability*, *13*(18), 10452. https://doi.org/10.3390/su131810452

Gibassier, D. (2018). *Corporate Water Accounting, Where Do We Stand? The International Water Accounting Field and French Organizations* (pp. 31–65). https://doi.org/10.1108/S1479-359820180000007002

Gilsbach, L., Schütte, P., & Franken, G. (2022). Water reporting in mining : Are corporates losing sight of stakeholder interests ? *Journal of Cleaner Production*, *345*(January), 131016. https://doi.org/10.1016/j.jclepro.2022.131016

Guerrero-Villegas, J., Pérez-Calero, L., Hurtado-González, J. M., & Giráldez-Puig, P. (2018). Board attributes and corporate social responsibility disclosure: A meta-analysis. *Sustainability (Switzerland)*, *10*(12), 1–22. https://doi.org/10.3390/su10124808

Haffner, J. A., & Monteiro, L. D. O. V. (2011). As relações econômicas entre Índia e Brasil: trajetória e perspectivas. *Proceedings of the 3rd ENABRI 2011 3 Encontro Nacional ABRI*.

Hair Jr, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis* (8th ed.). Cengage Learnin.

Haque, F., & Ntim, C. G. (2018). Environmental Policy, Sustainable Development, Governance Mechanisms and Environmental Performance. *Business Strategy and the Environment*, *27*(3), 415–435. https://doi.org/10.1002/bse.2007

Hazelton, J. (2013). Accounting as a human right: The case of water information. In *Accounting, Auditing and Accountability Journal* (Vol. 26, Issue 2). https://doi.org/10.1108/09513571311303738

Hewawithana, D., Hazelton, J., Walkerden, G., & Tello, E. (2021). *Will the revisions to GRI 303 improve corporate water reporting ? The challenges of de fi ning and operationalising " water stress ."* 320–343. https://doi.org/10.1108/MEDAR-12-2019-0639

Hou, C., Fu, H., Liu, X., & Wen, Y. (2020). The effect of recycled water information disclosure on public acceptance of recycled water—Evidence from residents of Xi'an, China. *Sustainable Cities and Society*, *61*(June), 102351. https://doi.org/10.1016/j.scs.2020.102351

Hou, C., Wen, Y., Liu, X., & Dong, M. (2021). Impacts of regional water shortage information disclosure on public acceptance of recycled water — evidences from China's urban residents. *Journal of Cleaner Production*, *278*, 123965. https://doi.org/10.1016/j.jclepro.2020.123965

Jarboui, A., Dammak Ben Hlima, N., & Bouaziz, D. (2023). Do sustainability committee characteristics affect CSR performance? Evidence from India. *Benchmarking: An*

International Journal, *30*(2), 628–652. https://doi.org/10.1108/BIJ-04-2021-0225
Khuong, N. V., Nguyen, T. T. H., Bui, H. M., Liem, N. T., Quoc, P. A., Nhi, D. Q. Y., Loan, N. T. K., Thu, D. M., & Bao, N. Q. (2022). The Effect of Water Disclosure on Firm Value in Vietnamese Listed Companies. *Polish Journal of Environmental Studies*, *31*(4), 3645–3651. https://doi.org/10.15244/pjoes/147288
Kleinman, G., Kuei, C., & Lee, P. (2017). Using Formal Concept Analysis to Examine Water Disclosure in Corporate Social Responsibility Reports. *Corporate Social Responsibility and Environmental Management*, *24*(4), 341–356. https://doi.org/10.1002/csr.1427
Kumar, A., & Singh, R. K. (2022). Does a retailer's performance depend on CSR practices? A stakeholder theory perspective from developing economy. *Benchmarking: An International Journal*, *29*(8), 2615–2638. https://doi.org/10.1108/BIJ-07-2021-0384
Latiff, N. (2022). *Water-related sustainability reporting practices amongst South African mining and non- mining corporations*. https://doi.org/10.21511/ee.12(1).2021.10
Linneman, M. H., Hoekstra, A. Y., & Berkhout, W. (2015). *Ranking Water Transparency of Dutch Stock-Listed Companies*. 4341–4359. https://doi.org/10.3390/su7044341
Liu, C., Su, K., & Zhang, M. (2021). Water disclosure and financial reporting quality for social changes: Empirical evidence from China. *Technological Forecasting and Social Change*, *166*(January), 120571. https://doi.org/10.1016/j.techfore.2021.120571
Morris, J., & Mcguinness, M. (2021). *Beyond water scarcity and e ffi ciency ? Water sustainability disclosures in corporate reporting*. https://doi.org/10.1108/SAMPJ-11-2021-0495
Naciti, V. (2019). Corporate governance and board of directors: The effect of a board composition on firm sustainability performance. *Journal of Cleaner Production*, *237*, 117727. https://doi.org/10.1016/j.jclepro.2019.117727
Northey, S. A., Mudd, G. M., Werner, T. T., Haque, N., & Yellishetty, M. (2019). Sustainable water management and improved corporate reporting in mining. *Water Resources and Industry*, *21*(December 2018), 100104. https://doi.org/10.1016/j.wri.2018.100104
Peng, X., Lan, Y. C., Li, J., & Fan, H. (2023). Board gender diversity, national culture, and water disclosure of multinational corporations. *Applied Economics*, *55*(14), 1581–1602. https://doi.org/10.1080/00036846.2022.2098240
Pérez-Cornejo, C., de Quevedo-Puente, E., & Delgado-García, J. B. (2019). How to manage corporate reputation? The effect of enterprise risk management systems and audit committees on corporate reputation. *European Management Journal*, *37*(4), 505–515. https://doi.org/10.1016/j.emj.2019.01.005
Sandhu, G., Weber, O., & Wood, M. O. (2018). *Water Risks , Conflicts , and Sustainable Water Investments : A Case Study of Ontario , Canada*. Springer International Publishing. https://doi.org/10.1007/978-3-030-77650-3
Signori, S., & Bodino, G. A. (2013). WATER MANAGEMENT AND ACCOUNTING : REMARKS AND NEW INSIGHTS FROM AN. In *Studies in Managerial and Financial Accounting* (Vol. 26). Emerald Group Publishing Limited. https://doi.org/10.1108/S1479-3512(2013)0000026004
Talbot, D., & Barbat, G. (2020). Water disclosure in the mining sector: An assessment of the credibility of sustainability reports. *Corporate Social Responsibility and Environmental Management*, *27*(3), 1241–1251. https://doi.org/10.1002/csr.1880
Tao-Schuchardt, M., & Kammerlander, N. (2023). Board diversity in family firms across cultures: A contingency analysis on the effects of gender and tenure diversity on firm performance. *Journal of Family Business Strategy*, 100554. https://doi.org/10.1016/j.jfbs.2023.100554
Thorne, L., Mahoney, L. S., Gregory, K., & Convery, S. (2017). A Comparison of Canadian and U.S. CSR Strategic Alliances, CSR Reporting, and CSR Performance: Insights into

Implicit–Explicit CSR. *Journal of Business Ethics*, *143*(1), 85–98. https://doi.org/10.1007/s10551-015-2799-6

UN Water. (2023). *The United Nations World Water Development Report 2023: partnerships and cooperation for water*. https://www.unwater.org/publications/un-world-water-development-report-2023

Wan Mohammad, W. M., & Wasiuzzaman, S. (2019). Effect of audit committee independence, board ethnicity and family ownership on earnings management in Malaysia. *Journal of Accounting in Emerging Economies*, *10*(1), 74–99. https://doi.org/10.1108/JAEE-01-2019-0001

Wang, S., Zhao, S., Shao, D., Fan, X., & Zhang, B. (2022). *Impact of Managerial Reputation and Risk-Taking on Enterprise Innovation Investment From the Perspective of Social Capital : Evidence From China*. *13*(July). https://doi.org/10.3389/fpsyg.2022.931227

Wicaksono, A. P., & Setiawan, D. (2022). Water disclosure in the agriculture industry: Does stakeholder influence matter? *Journal of Cleaner Production*, *337*, 130605. https://doi.org/10.1016/j.jclepro.2022.130605

Wicaksono, A. P., & Setiawan, D. (2023). Impacts of stakeholder pressure on water disclosure within Asian mining companies. *Environment, Development and Sustainability*, *36*. https://doi.org/10.1007/s10668-023-02972-0

Yu, H. C., Kuo, L., & Ma, B. (2020). The drivers of corporate water disclosure in enhancing information transparency. *Sustainability (Switzerland)*, *12*(1), 1–14. https://doi.org/10.3390/su12010385

Zeng, H., & Chen, X. (2019). *Water disclosure and firm risk : Empirical evidence from highly water - sensitive industries in China*. *2030*(July 2018), 1–22. https://doi.org/10.1002/bse.2347

Zeng, H., Zhang, T., Zhou, Z., Zhao, Y., & Chen, X. (2020). Water disclosure and firm risk: Empirical evidence from highly water-sensitive industries in China. *Business Strategy and the Environment*, *29*(1), 17–38. https://doi.org/10.1002/bse.2347

Zhang, L., Tang, Q., & Huang, R. H. (2021). Mind the Gap: Is Water Disclosure a Missing Component of Corporate Social Responsibility? *The British Accounting Review*, *53*(1), 100940. https://doi.org/10.1016/j.bar.2020.100940

Zhou, Q., Wang, Y., Zeng, M., Jin, Y., & Zeng, H. (2021). Does China's river chief policy improve corporate water disclosure? A quasi-natural experimental. *Journal of Cleaner Production*, *311*(May), 127707. https://doi.org/10.1016/j.jclepro.2021.127707

Zhou, Z., Liu, L., Zeng, H., & Chen, X. (2018). Does water disclosure cause a rise in corporate risk-taking?—Evidence from Chinese high water-risk industries. *Journal of Cleaner Production*, *195*, 1313–1325. https://doi.org/10.1016/j.jclepro.2018.06.001