# Corporate Commitment to Water Sustainability: Determinants of Water Disclosure in the Agricultural and Healthcare Sectors in Malaysia

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## ABSTRACT

Addressing the corporate water sustainability is crucial for both firms and stakeholders. Over the past decade, various analysis on Malaysian firms in agricultural and healthcare sectors have been conducted, focusing on their varying degrees of water sustainability, although studies on water disclosure are limited. This study explored corporate water sustainability by investigating the determinants of corporate water disclosure among publicly listed firms in Malaysia's agricultural and healthcare sectors. Utilizing a quantitative research approach and regression analysis, the results indicated that ISO 14001-certified firms exhibited significantly higher levels of water disclosure. Firms that were Shariah compliant also disclosed more water-related information than non-compliant firms, reinforcing the view that Shariah status supported ethical conduct and sustainability disclosure practices. The empirical evidence demonstrating that externally imposed expectations - whether through environmental management standards or ethical governance requirements can influence corporate disclosure behaviour, which consistent with the Stakeholder Theory. The analysis further revealed that agricultural firms disclosed more water information than those in the healthcare sector, reflecting the higher water sensitivity and stakeholder scrutiny in the agriculture sector.

**Keywords:** Water Disclosure, Agriculture, Sustainability, Healthcare, Shariah Compliance

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## INTRODUCTION

The world is currently grappling with a water crisis, posing significant challenges to the global economy's stability. However, amidst these challenges lies a notable opportunity for innovation and growth. Firms and investors can navigate this crisis by measuring its impact, managing associated risks, and seizing opportunities. Transparency and proactive action are key, as disclosing environmental data enhance reputation and differentiate the firms against their peers. In both the agricultural and healthcare sectors, water disclosure plays a pivotal role in fostering sustainable practices. It enables firms to assess usage, identify inefficiencies, and implement conservation strategies, leading to improved crop yields and environmental stewardship in agriculture, and ensuring safety and sanitation in healthcare facilities. Ultimately, water disclosure promotes transparency, accountability, and informed decision-making, fostering the long-term sustainability of businesses in these critical industries.

The attention to disclose the information about water resources consumption in financial reporting has deteriorated, particularly in Asian countries, despite its significance (Wahyuningrum *et al.*, 2023) in promoting accountability and responsible water management for both firms and society at large. Extant researches have highlighted the significance of water disclosure (Burritt *et al*. 2016; Zhang *et al.,* 2020; Wicaksono & Setiawan, 2022; Wahyuningrum *et al.,* 2023) and the topic continues to emerge in various aspects within the social and environmental reporting literature. The disclosure includes identifying, quantifying and reporting water related information while ensuring its accuracy and credibility of the data before public dissemination (Gibassier, 2018).ku

As highlighted by Raihan *et al.* (2023), Malaysia experienced water supply disruptions in 2020, particularly in the State of Selangor and Klang Valley which contributed to business losses, property values at risk and major economic impact for about 34% of Malaysia's Growth Domestic Product (GDP). The research disclosed that 46% of the respondents from properties industries in the commercial, residential, and industrial sectors experienced losses totaling RM2,053 million. In addition, the disruptions exposed businesses to significant risks that impacted the physical operations and overall financial health of the firm, particularly those firms with high

reliance on water in the business (Wedawatta & Ingirige, 2012). From the context of public health, the deterioration in the water supply management risks the community with contaminated water which contributes to the potential outbreaks of waterborne diseases (Bross *et al*., 2021). Increasing in awareness of the adverse impact poor water management leads firm to prioritize effective water management in ensuring business continuity, long-term growth and socio-economic development (Deng *et al*., 2022). Many firms are now increasingly focusing on disclosing information on water resources as part of their commitment towards sustainability practices (Ali *et al*., 2021). Recognizing the significance, the accounting standards focusing on water disclosure has been developed and came into effective to assess water-related activities by the firm or its products.

Some industries are highly dependent on water availability, quality and effective management in ensuring survival of the businesses. The heavy reliance on water resources for daily operations and high vulnerability to water-related risks categorized some firms as operating in water-sensitive industries (Lambooy, 2011; Leong *et al*., 2014; Zhang *et al*., 2021). The high-risk exposure pressures these firms in disclosing water-related information than those in less risky positions (Burritt *et al.*, 2016; Yu *et al.*, 2020; Wicaksono & Setiawan, 2022; Zhang *et al*., 2020). Thus, in mitigating the risk exposure and potential regulatory actions on their business operations, firms have built a good rapport with government agencies through the improvement of water resource management and comprehensive disclosures (Burritt *et al*., 2016; Morrison *et al*., 2009; Signori & Bodino, 2013). Several industries have been recognized as water-sensitive industries including agriculture (Linneman *et al*., 2015; Burritt *et al*., 2016; Wicaksono & Setiawan, 2022), healthcare (Morikawa *et al*., 2007; Zhang & Tang, 2013; Blake & Hawley, 2019; Zhang *et al.,* 2021), mining (Burritt *et al*., 2016; Northey *et al.*, 2016; Cesar & Jhony 2021; Nguyen, 2021), utilities (Zhang & Tang, 2013; Burritt *et al*., 2016; Zhang *et al.,* 2021), energy (Zhang & Tang, 2013; Burritt *et al*., 2016; Zhang *et al.,* 2021) and automobile (Ben-Amar & Chelli, 2018). However, due to time constraints, this study specifically focused on two prime industries in Malaysia that heavily reliedf on water in the production process, namely, agricultural and healthcare.

Additionally, Burritt et al. (2016) emphasized that understanding the drivers behind companies' decisions to disclose water-related information

is key to enhancing corporate non-financial reporting. This paper focused specifically on examining a company's characteristics as possible drivers, as earlier studies frequently showed that factors such as profitability, firm's leverage and being in watersensitive industries (Burritt et al., 2016; Yu et al., 2020) were associated with higher levels of water disclosure. Therefore, this study specifically aimed to investigate the determinants of corporate water disclosure in Malaysia's agricultural and healthcare sectors, by investigating company characteristics as possible motivational factors for such corporate disclosure.

The current study contributes to the literature of water disclosures in several ways. Firstly, this study concentrated on water disclosure practices of individual firms in identified agricultural and healthcare industries in Malaysia rather than the disclosures at the market level. Secondly, the study enhanced the understanding of potential investors on water disclosure practices for two specific agricultural and healthcare industries. Responding to the call from Wicaksono & Setiawan (2022), this study examined corporate water reporting from water-sensitive sectors, specifically to empower and assist investors who are environmentally oriented to make more informed investment decisions. For regulators, the study emphasized the needs to consider sector- specific differences including external and internal influences when developing regulations pertaining to environmental and sustainability reporting in Malaysia. Finally, the study revealed the positive interconnections between water disclosure and shariah-compliant firms, suggesting that these firms may provide higher levels of environmental reporting (Azam *et al*., 2019).

The next section discusses existing literature under study together with the hypotheses development, followed by the explanation on research methods and results of the study. Finally, the study concludes and provides suggestions for future research.

# LITERATURE REVIEW

## Water Disclosure

Water disclosure is typically part of broader sustainability reporting frameworks, the avenues for firms to communicate information about their environmental, social, and governance (ESG) practices (Zhang et al., 2021; Mesa-Perez et al., 2025). The disclosures help investors, stakeholders, and the community at large to assess a firms' performance in managing water resources, public health and sustainability issues, including water management (Hazelton, 2013; Egan, 2015). Studies on water disclosure are emerging (Zeng et al., 2020; Zhang et al., 2021; Mohamad et al., 2023; Mesa-Perez et al., 2025; Santoso et al., 2025). Early studies on water disclosure have focused on investigating the extent of water-related information reported by organizations (Morrison et al., 2009; Ahmad et al., 2010; Lambooy, 2011; Leong et al., 2014; Egan, 2015) and the types of water information disclosed (Morikawa et al. 2007; Botha & Middelberg, 2016; Gibassier, 2018). Recent studies are increasingly examining factors determining corporate water disclosure practices (Zhang & Tang 2013; Burritt et al., 2016; Zhou et al., 2018; Zeng et al., 2020; Zhang et al., 2021; Wicaksono & Setiawan, 2022; 2024; Wahyuningrum et al., 2023). However, the studies on water-related disclosure remained limited as compared to other environmental reporting fields such as carbon and climate change disclosure studies. Also, existing studies have not lookedat the specific company characteristics such as possession of ISO 14001 certification and Shariah-compliant firms as possible factors motivating companies to provide water disclosure. Furthermore, very few studies have investigatedthe practices of water-sensitive companies in the South East Asian countries (see for example, Wicaksono & Setiawan, 2022;2024; Wahyuningrum et al., 2023), while there is relatively scant literature that has specifically focused on he Malaysia context. To address these gaps, we investigated how corporate water disclosure was related to company' characteristics within water-sensitive industries in Malaysia.

## Stakeholder Theory

The Stakeholder Theory suggests that corporate environmental and social practices fosterpositive relationship with the stakeholders including

consumers and employees (Fauver et al., 2018). The Theory highlights the importance of managing relationship with diverse stakeholders for long-term company performance (Agle et al. 2008; Ullmann 1985). For instance, the engagement of various parties such as farmers, communities, and policymakers in the agricultural sector could improve water management effectiveness, by considering stakeholders' insights in decision-making processes (Lacroix & Megdal, 2016). For healthcare companies, open discussions among patients, healthcare centres and regulators in water management contributes to effective policies and practices benefiting both firms and public health (Chief et al., 2016). Water disclosures serve as critical issue in sustainable resource management in both industries as a result of challenges on water quality and resources availability that impacted the business, environment and society at large.

Under the Stakeholder Theory, disclosing environmental information publicly is important for companies to manage stakeholder relationships by demonstrating accountability and responsiveness to their concerns (Deegan 2002; Kent & Chan 2009). The disclosure should be transparent to facilitate stakeholders' informed judgement. Companies can employ environmental disclosure (including water) to build or maintain support of their stakeholders as a signal of a company accountability (Gray, 2006; Burritt et al. 2016; Wicaksono & Setiawan, 2024). Therefore, the Stakeholder Theory holds that management should acknowledge the validity of diverse stakeholder interests and respond toit, as this is essential for company to be legitimate in the eyes of its stakeholders (Ullmann 1985; Zhang et al. 2021).

## Agriculture Sector

The Agricultural sector significantly involves heavy utilization of water resources (Wahyuningrum et al., 2023) and requires meticulous water management. Rodriquez (2018) highlighted that over 80% of untreated wastewater from agriculture activities potentially caused harm to both ecosystems and communities. In Malaysia, this sector served as cornerstone in the history and economic development. The climate change, particularly the "El Nino effect" and extreme weather events, including unexpected changes in temperature and rainfall patterns, posed a major threat to the production of this sector as it may disrupt palm oil and crops (Sarkar et al., 2020), thus contribute to fluctuations in the country's GDP. The production

of crude palm oil was highly reliable on weather conditions; hence climate change exhibited yield fluctuations dramatically. Other challenges to the sector included the susceptibility to a range of natural and man-made disasters such as floods, droughts, landslides, haze and tsunamis (Lambert & Parker, 1998), causing damages to the agricultural produces, losses to the business and potential fatalities (Piao et al., 2010).

In response to the risk and challenges faced by the sector, it is imperative to address the sector's relationship with water disclosure due to the heavy usage of approximately 76% of available global water, primarily for irrigation, and industrialization in developed regions which demanded greater water resources (Anang et al., 2019; Valizadeh & Hayati, 2021; Wicaksono & Setiawan, 2022). Besides, a growing number of stakeholders are putting pressure on agricultural firms to reveal their water management strategies and attempted to reduce risks associated with water due to their huge water usage. There is an increasing expectation that the agriculture sector will take proactive measures to protect water resources due to concerns about water scarcity. This anticipation is a result of the awareness on the implications of water stress and scarcity caused mainly by agricultural operations (Talukder et al., 2020; Valizadeh & Hayati, 2021). The emergence of a water crisis in the agriculture sector has garnered significant attention, with Burritt et al. (2016) contending that water-sensitive firms were under substantial pressure to guarantee both adequate and high-quality of water for business activities. In addition, stakeholders were increasingly influencing firms to address and be responsible for any potential adverse impacts on their water usage, given their significant contribution to the water crisis (Hazelton, 2015). Recognizing its major water consumption, the agricultural sector was expected to actively participate in preserving water conservation, as highlighted by Talukder et al. (2020) and Valizadeh & Hayati (2021).

## Healthcare Sector

Another sector under review is healthcare firms that have a moral obligation to contribute to sustainability by minimizing the environmental impact (Fitzpatrick, 2010) aiming to improve human health and well-being. Healthcare firms are accountable to embrace environmental sustainability as part of their mission fulfilment and commitment to public health (Jarousse, 2012). Improper waste management from healthcare providers including

hospitals, clinics, rehabilitation centres and laboratories posed significant risks not only to patients, but the employees, surrounding community, and the environment. Several ways have been identified to take advantage of the opportunities in enhancing healthcare firm's sustainability. Among others are implementing robust water and waste management strategies, enhanced energy efficiency, and to adopt any sustainable practices to minimize environmental impact.

The emergence of world pandemic in 2020, the Covid-19 virus caused a global lockdown and became an unprecedented crisis in the healthcare sector. All these environmental health issues have been managed by healthcare officers, where they planned and implemented corrective actions to lessen the impact towards environment and human population. Thus, the healthcare sector, by its very nature, was tasked with addressing social and environmental concerns as part of its operations. This responsibility extended to ensuring that these issues were accurately represented through comprehensive sustainability disclosure practices. One crucial aspect of this disclosure was effective water management and disposal strategies, which were indispensable for health facilities to fulfill their mandate of delivering essential services, both in routine circumstances and during crises (Van der Heijden et al., 2022). The reliability of water supply and adherence to stringent standards played crucial roles in ensuring uninterrupted service provision, as disruptions significantly impacedt healthcare delivery. The level of awareness pertaining to these challenges and the degree of dependence on continuous services were key determinants of the sector's resilience. For instance, in areas with consistent water access, facilities must anticipate higher water consumption to sustain limited service levels and manage intermittent supply disruptions effectively (Khan et al., 2021). These considerations brought attention to the importance of integrating environmental disclosure scores into healthcare sector aim in enhancing transparency and accountability as an effort to mitigate sustainability challenges (Martins et al., 2020; Van Hoang et al., 2021; Garzoni et al., 2023).

## Water Disclosure and Water Sensitive Sector

Firms in water-sensitive industries face greater pressure in disclosing information relating to water as compared to those with low water

dependability. Burritt *et al*. (2016) had conducted an analysis on 100 largest Japanese water-sensitive firms, categorized these firms as those that required high water consumption and exposed to high potential of wastewater or pollution risks. This was consistent with findings from Zhang and Tang (2013), Linneman *et al.* (2015) and Zhang *et al.* (2021) which demonstrated that water-sensitive firms tended to provide more extensive disclosures for better risk management and sign of commitment to transparency and accountability. More specifically, Zhang et al. (2021) conducted a study on the sample of 1,604 firm-year observations identified in the CDP water program indicated that firms categorized under the most likely industries to be affected by water scarcity and water quality were more eager to provide water disclosures. The industries identified included energy, materials, food, beverage and tobacco, pharmaceuticals and utilities (Zhang et al., 2021). Indeed, Mesa-Perez et al. (2025) demonstrated that companies operating in water-intensive industries exhibited greater levels of water disclosures than those in non-water-intensive companies.

From the perspective of the Stakeholder Theory, it can be argued that managers in water-sensitive industries emphasized disclosing positive environmental practices. This alignment with stakeholder expectations served multiple purposes: building trust, enhancing reputation, managing risks, and ensuring the firm's long-term sustainability. By fulfilling these stakeholder expectations, managers demonstrated their responsibility towards both society and the wider stakeholder network, embodying the essence of the Stakeholder Theory. In light of the above discussion, this study developed the following hypothesis:

**$H_1$**: There is a significant positive association between corporate water disclosure and water sensitive sectors.

## Water Disclosure and Profitability

Profitability plays a pivotal role in a firm's sustainability, as it signifies financial stability, enabling the disclosure of robust non-financial data, particularly regarding water-related aspects (Wahyuningrum et al., 2023). This transparency is vital for demonstrating trustworthiness and the ability to generate substantial profits while upholding legitimacy to stakeholders. Moreover, highly profitable firms are better positioned to address water

management issues, including sourcing, recycling, and wastewater management. Nagendrakumar et al. (2022) highlightedthe sensitivity of environmental policies to profitability, indicating that profitability equipped businesses to address stakeholder concerns effectively. This aligned with the Stakeholder Theory, which posits that as profitability increases, stakeholders' expectations motivated firms to provide extensive water-related information (Moreno & Duerto-Atoche 2019). This stemmed from the fact that profitable firms had abundant resources and flexibility for meeting stakeholders' demand (Lu & Abeysekera 2014). Thus, as profitability increased, stakeholders' expectations drove corporations to furnish more comprehensive water management information.

To measure profitability of water-sensitive firms, this study utilized Return on Assets (ROA), calculated as net income divided by total assets (Braam et al., 2016 and Baalouch et al., 2019). The ROA is commonly used to assesses a firms' efficiency in generating profits from its available assets. Previous scholars utilizing the Stakeholder Theory emphasized that companies with high ROA were more likely to engage in stronger environmental practices (Clarkson et al., 2011; Ullmann, 1985). Thus, the proposed hypothesis was stated as follows:

**$H_2$**: There is a significant positive association between corporate water disclosure and a company's profitability

## Water Disclosure and Firm Leverage

Creditors, as providers of corporate loans have significant influence in firms, given their ability to impact corporate disclosure practices (Yu et al., 2020). Burritt et al. (2016), Zhou et al. (2018), Yu et al. (2020) and Abdul Latif (2023) have indicated that when firms maintained low levels of leverage, creditors tended to exert less pressure on managerial discretion regarding disclosure. This was consistent with the Stakeholder Theory that held that firms with a higher degree of leverage were expected to be more proactive to responding to issues demanded by stakeholders (Roberts 1992). In other words, when a firm had less debt, creditors were less likely to push for extensive disclosure requirements. In the water-related disclosure literature, firms discharging high volumes of chemically-laden wastewater faced substantial financial risks (Morrison et al., 2009). Hence, the firms

were enforced to enhance wastewater management disclosure to mitigate the risks and gain trusts among financial providers. The financial risks, including higher borrowing costs and increased in premiums categorized as significant business risks can be resolved by the implementation of robust water accounting system (Christ & Burritt, 2017). Thus, the proposed hypothesis was stated as follows:

**$H_3$**: There is a significant positive association between corporate water disclosure and a company's leverage.

## Water Disclosure and ISO 14001 Certification

An increasing number of studies have investigated the association between corporate social and environmental disclosure and ISO certification (Sumiani et al, 2007; Monteiro & Aibar-Guzman, 2010). ISO 14001 is an internationally recognized standards focusing on environmental management framework of the organization encompasses policies, environmental aspects of its operations, goals and environmental improvement, monitoring and refinement of environmental management system (Weaver, 1996). Moreover, the whole process requires a proper documentation system for management review, and to be audited by external auditors (Jiang & Bansal, 2003).

Previous studies have indicated that firms obtaining ISO 14001 certification were more proactive in improving their environmental performance (Bhalla & Singh, 2018). It was also argued that various water management issues were more likely to be addressed by firms with ISO 14001 certifications as opposed to those without the certification (Lambooy, 2011). Firms holding the certification demonstrated effective water management practices enabling the ability to address water challenges, while aligning the firm's policy with continuous improvement in water resource stewardship (Morikawa et al., 2007). This action can then be communicated to stakeholders through water disclosures (Camilleri 2022). The Stakeholder Theory suggests that organizations which align their practices with environmental regulations or standards can strengthen legitimacy among stakeholders (Beck et al., 2017). The regulatory principles and guidelines can assist managers in identifying, managing, monitor and control corporate sustainability practices. Accordingly, managers from ISO 14001 certified firms are expected to transparently communicate

comprehensive and ongoing disclosures to alleviate stakeholders' concerns regarding environmental performance (Salim et al., 2018).

Therefore, consistent with previous studies (Prado-Lorenzo et al., 2009; Moreno & Duarte-Atoche, 2019), the presence/absence of an ISO 14001 certification as a proxy for the firm's strategic posture was included. Drawing upon prior literature and the principles of the Stakeholder tTeory, it was argued that there was positive relationship between water disclosure and ISO 14001 certification. Hence, this study tested the following hypothesis:

**$H_4$**: There is a significant positive association between corporate water disclosure and ISO 14001 Certification.

## Water Disclosure and Shariah-Compliant Firms

The presence of Shariah principles governing political, social and economic actions of Muslims and Islamic organizations served as key advantage of corporate disclosure among Malaysian listed firms. Abdul Latif et al. (2023) emphasized the Shariah principles can significantly influence ethical business conduct by safeguarding stakeholder rights to ensure balance treatment against the shareholders, and fostering transparency in managerial behaviour. Shariah-compliant firms were expected to exhibit stronger ethical conduct and responsible business behaviour due to the normative requirements embedded in Islamic jurisprudence. These ethical expectations required Shariah-compliant firms to uphold good management practices, including social and environmental responsibility, driven by a belief in accountability to both stakeholders and ultimately to God.

A central Islamic principle relevant to environmental governance is Sadd al-Dharā'i', which prohibited actions that may seem permissible but could lead to harm (mafsadah). This doctrine operated as a preventive mechanism to curb activities with detrimental environmental consequences, ensuring the protection of society and ecological stability (Wan Hassan & Md Noor, 2025). In a corporate setting, Sadd al-Dharā'i' implies that Shariah-compliant firms must evaluate not only the legality of their actions but also their long-term environmental impacts. Practices that contribute to water scarcity, water pollution, or inefficient water usage may therefore be viewed as violating this principle. Consequently, Shariah-compliant firms

are encouraged to adopt proactive environmental governance and enhance transparency in communicating potential environmental risks, including those related to water management.

Within the Stakeholder Theory, Shariah-compliant firms faced heightened expectations from investors, regulators, and society to uphold Islamic ethical principles such as stewardship of natural resources (khalifah), integrity, and the avoidance of harm (mafsadah). This reinforced the firm's obligation to maintain transparency in environmental practices, particularly in water management for water-sensitive industries. The Stakeholder Theory suggests that when stakeholders demand environmental practices, firms respond by enhancing their sustainability practices and disclosure behaviours to protect legitimacy and foster societal demands (Yu et al., 2020). In this context, Shariah compliance functions as a sustainability-oriented governance mechanism that motivates companies to demonstrate transparency in their environmental conduct.

These theoretical expectations aligned with empirical findings. Azam et al. (2019) reported strong interconnections between Shariah compliance and CSR activities in Pakistan. In Malaysia, Shariah-compliant firms have been shown to disclose higher levels of environmental information compared to non-Shariah firms (Anuar et al., 2009). Supporting evidence from Indonesia also indicated that Shariah-compliant firms tended to exhibit greater voluntary disclosure, demonstrating their commitment to transparency and mitigation of information asymmetry (Nugraheni & Anuar, 2014; Ali & Al-Owaihan, 2008). Taken together, Islamic ethical principles and empirical insights suggesedt that Shariah-compliant firms were more likely to engage in comprehensive environmental reporting, including water-related disclosure. Hence, this study tested the following hypothesis:

**$H_5$**: There is a significant positive association between corporate water disclosure and Shariah compliance companies.

## METHODOLOGY

To examine the relationship between water disclosure and factors affecting such disclosure, a sample was selected from the agricultural and healthcare

firms listed in Bursa Malaysia for the year 2019 to 2021. In particular, this study used an unbalanced panel data estimation method which consisted of 96 observations from 32 firms. The unbalanced datasets was due to number of Shariah-compliant firms in the healthcare sector varied across the period. Only 16 firms were identified in 2019 before it increased to 17 firms in 2020 and 2021. Since Shariah-compliant firms is one of disclosure determinants, the differing number of firms resulted in an unbalanced panel. This study examined both annual reports and sustainability reports of the public listed firms within both the agricultural and healthcare sector in Malaysia to obtain comprehensive data on water disclosures. This study excluded firms without sustainability reports available to the public.

## Measurement

In this study, the Water disclosure score (WATDISC) served as the dependent variable. Using content analysis, the score of 1 was assigned for availability of water disclosure, otherwise, 0 if no disclosure was identified in Global Reporting Initiative (GRI) of both the agricultural and healthcare sectors in Malaysia. The eight (8) water information disclosure items were Consumption metrics (water usage/water withdrawal/water consumption), Administrative/Management Information, Adoption of significant water reporting standard/policy, Adherence to regulations, Compliance with external requirements, Assurance statement, Water recycle, and Water Quality. The scores were then analyzed to identify the extent of disclosure and factors influencing such disclosures. To ensure reliability and consistency, the content analysis wasconducted by two independent coders for the same samples in GRI reports using percentage agreement. The agreement percentage exceeded 80%, indicating strong reliability.

In addition, the independent variables in this study aligned with those used by Burritt et al. (2016), Zhou et al. (2018), Yu et al. (2020), Liu et al. (2021) and Abdul Latif et al. (2023) which encompassed environmental management (i) International standard procedure ISO 14000 (ISO), (ii) financial leverage (LEV), (iii) shariah compliance (SHARIAH), and (iv) firm's profitability measured through return on assets (ROA).

The shariah compliance variable was treated using a dummy approach, assigning a value of 1 if the firm adhered to the compliance and 0 if it did

not. Similarly, the ISO standard variable was assigned a value of 1 if the firm followed the standard and 0 if it did not. Financial leverage was calculated as the ratio of total debt by total equity. For water sensitive sector, a value of 1 was assigned to agricultural sector and 0 for healthcare firms in Malaysia.

## Data Analysis

The analysis comprised of two main components: descriptive statistics and regression analysis. Descriptive statistics provides a set of tools to summarize and describe the main characteristics of a datasets, allowing for comprehensive understanding of overall patterns and trends. These techniques play a crucial role in organizing, simplifying, and presenting data meaningfully. They provide insights into central tendencies, variability, and distribution of the datasets. Descriptive statistics are focused on describing and summarizing the primary characteristics of a datasets, without making inferences about a population based on sample data references.

Regression analysis, particularly Ordinary Least Squares (OLS), served as a robust statistical method employed in this study to assess a specific model. The model aimed to delve into and comprehend the factors influencing water information disclosure within the agricultural and healthcare sector in Malaysia. By utilizing OLS regression, the study soughtto quantify the relationships between the dependent variable, which was water information disclosure, and various independent variables representing potential influencing factors. These independent variables could encompass a range of factors such as agricultural practices, regulatory frameworks, technological adoption, and environmental awareness. Through the analysis of the regression results, the research sought to understand and quantify the extent of the magnitude and direction of the impact each variable had on water information disclosure in the Malaysian agricultural and healthcare industries. This approach aided in understanding the intricate dynamics and contributing factors to water information transparency within the context of both industries in Malaysia. The equation below was the foundational equation upon which the hypotheses of the model was built.

Equations and formulae should be typed and numbered consecutively with Arabic numerals in parentheses on the right hand side of the page (if referred to explicitly in the text). They should also be separated from the surrounding text by one space (12 pt)

$$WATDISCit = \beta_0 + \beta_1 ISOit + \beta_2 LEVit + \beta_3 SHARIAHit + \beta_4 ROAit + \beta_5 TYPEit + e_{i,t}. \quad (1)$$

Where:

1. WATDISC*it* represented the water disclosure score for firm *i* in period *t*
2. ISO*it* was the ISO standard variable for firm *i* in period *t*
3. LEV*it* was the financial leverage (LEV) variable for firm *i* in period *t*
4. SHARIAH*it* iwasthe shariah compliance (SHARIAH) variable for firm *i* in period *t*
5. ROA*it* was the return on assets (ROA) for firm *i* in period *t*
6. TYPE*it* was the firm sector
7. β0 was the intercept term
8. e*i,t* was the error term capturing unobserved factors affecting the water disclosure score for firm *i* in period *t*.

## RESULTS AND DISCUSSION

Table 1 provides the descriptive statistics for the variables used in this research. The analysis revealed varied distributions across different metrics among firms. The Water disclosure (WATDISC) score showed a mean of 4.635 and a median of 2, indicating a diverse range of disclosure levels. With a maximum score of 21, some firms excelled in water disclosure, while others, with a minimum of 0, had little to no disclosure. The standard deviation of 5.126 and positive skewness of 1.352 suggested significant dispersion from the mean, with most firms clustering towards lower levels but with notable outliers towards higher scores.

**Table 1: Descriptive Statistics**

| | WATDISC | LEV | ISO | ROA | SHARIAH | TYPE |
|---|---|---|---|---|---|---|
| Mean | 4.635 | 0.353 | 0.167 | 6.246 | 0.854 | 0.438 |
| Median | 2 | 0.231 | 0 | 5.305 | 1 | 0 |
| Maximum | 21 | 2 | 1 | 79.980 | 1 | 1 |
| Minimum | 0 | -0.5719 | 0 | -33.820 | 0 | 0 |
| Std. Dev. | 5.126 | 0.469 | 0.375 | 13.076 | 0.355 | 0.499 |
| Skewness | 1.352 | 1.208 | 1.789 | 2.319 | -2.007 | 0.252 |
| Kurtosis | 4.025 | 5.035 | 4.200 | 14.758 | 5.028 | 1.063 |
| Jarque-Bera | 33.465 | 39.905 | 56.960 | 639.000 | 80.895 | 16.016 |
| Probability | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Sum | 445 | 33.8963 | 16 | 599.61 | 82 | 42 |
| Sum Sq. Dev. | 2496.240 | 20.921 | 13.333 | 16242.216 | 11.958 | 23.625 |
| Observations | 96 | 96 | 96 | 96 | 96 | 96 |

Similarly, the leverage ratio (LEV) exhibited a mean of 0.353 and a median of 0.231, indicating variance in debt-to-equity ratios. While some firms hadhigh leverage (maximum of 2), others hadnegative leverage (minimum of -0.5719), with a right-skewed distribution suggested by a positive skewness of 1.208. Compliance with ISO standards was relatively low, with a mean of 0.167 and median of 0, suggesting limited adherence overall. The distribution is right-skewed (positive skewness of 1.789), indicated more firms with lower compliance levels but with some outliers demonstrating high compliance. The Return on Assets (ROA) showed positive profitability overall, with a mean of 6.246 and a median of 5.305. However, there was considerable variability, ranging from -33.820 to 79.980, with a right-skewed distribution and heavy tails (kurtosis of 14.758). Lastly for Shariah compliance, with a mean of 0.854 and median of 1 indicated that most firms adhered to Islamic principles. The distribution was left-skewed, with more compliant firms (negative skewness of -2.007)

The result further revealed that the agricultural sector was the most water sensitive sector compared to healthcare, indicated by a mean of 0.438. The standard deviation of 0.499 indicated some variability in the water sensitive sector. Overall, the findings provided insights into the sector composition and temporal dynamics of the dataset, which informed further analysis and strategic decision-making.

## Normality Test Based on Jarque-Bera Test

The classical assumption test involved a statistical evaluation of the dependent variable, assuming the fulfillment of Ordinary Least Square (OLS) criteria. In this study, the normality test utilized the Jarque-Bera test. The results are presented in Table 2, with decision-making guided by a significance level greater than 0.05 or 5%. Table 2 indicated that a significance value of all indicators were 0.000 (p-value <0.05) from the Jarque-Bera test, suggesting that all data exhibited a normal distribution.

**Table 2: Normality Test**

| | WATDISC | LEV | ISO | ROA | SHARIAH | TYPE |
|---|---|---|---|---|---|---|
| Jarque-Bera | 33.465 | 39.905 | 56.960 | 639.000 | 80.895 | 16.016 |
| Probability | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

## Regression Analysis

The Ordinary Least Squares (OLS) regression analysis was conducted to examine the relationship between water disclosure scores of agricultural firms (dependent variable) and several independent variables, recognized as financial leverage (LEV), adherence to ISO standard procedures (ISO), return on assets (ROA), Shariah compliance (SHARIAH) and type of water sensitive sectors (TYPE).

**Table 3: Regression Analysis of factor Influence Water Disclosure Score**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.053490 | 0.222235 | -0.240689 | 0.8103 |
| LEV | 0.086754 | 0.158718 | 0.546591 | 0.5860 |
| ISO | 0.353291 | 0.208284 | 1.696195 | 0.0933* |
| SHARIAH | 0.479919 | 0.206492 | 2.324153 | 0.0224* |
| ROA | 0.002577 | 0.005718 | 0.450613 | 0.6534 |
| TYPE | 0.710763 | 0.154873 | 4.589342 | 0.0000*** |
| R-squared | 0.233049 | Mean dependent var | | 0.773007 |
| Adjusted R-squared | 0.190441 | S.D. dependent var | | 0.767277 |
| S.E. of regression | 0.690361 | Akaike info criterion | | 2.157258 |
| Sum squared resid | 42.89390 | Schwarz criterion | | 2.317530 |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| Log likelihood | -97.54841 | F-statistic | | 5.469572 |
| Durbin-Watson stat | 1.208378 | Prob(F-statistic) | | 0.000193 |

Note: Significant level * p < 0.1, ** p < 0.05, *** p < 0.01

The finding as in Table 3 showed that financial performance indicators, leverage (LEV) and profitability (ROA) were not significant in influencing the water disclosure score of the firm, thus failing to reject the null hypothesis of this study (p-value LEV: 0.5860; p-value ROA: 0.6534). This result stands in contrast with the findings of previous studies which indicated that the leverage factor (LEV) positively affected the water disclosure score (Braam *et al*., 2016; Baalouch *et al*., 2019; Nagendrakumar *et al*., 2022). Likewise, Abdul Latif (2023), Yu *et al.* (2020), Zhou *et al.* (2018) and Burritt *et al*. (22016) hadstated that the profitability factor (ROA) was an important indicator that influenced the stakeholder's decision to publicly disclose the water disclosure score to the public and be transparent about the environmental report of a corporate firm.

Despite the insignificance on LEV and ROA, the model demonstrated a modest explanatory power of 23.3% ($R^2 = 0.233049$) of the variation in corporate water disclosure. The significant F-statistic ($p = 0.000193$) indicated the factors identified cumulatively impacted the disclosure. To the contrary, the Durbin–Watson value showed a positive correlation, suggesting that they were not fully independent. Both model selection criteria; Akaike and Schwarz supported reasonable fit, although predictive errors remained moderate (SE = 0.690361). Thus, the factors were significant but hada moderate influence over a firm's water disclosure, suggesting possible consideration of other factors that might influence the disclosures in both sectors.

Interestingly, the study revealed that the ISO 14001 certification possessed by firms (p-value: 0.0933 < 0.10) and SHARIAH compliance firms (p-value: 0.0224 < 0.10) were positively associated to the water disclosure score at the 10 percent significance level. This was due to the fact that by complying to ISO 14001 certification, firms can better understand their environmental impact including issues on water information (Camilleri 2022). This disclosure through corporate reports in turn gavea better

understanding to their stakeholders. The finding is aligned with Campos *et al.* (2015) and Sumiani *et al.* (2007) which stated that ISO 14001 certification was one of the important indicators to measure firms' commitment on sustainability, thus encouraging responsible water management practices in corporate operations while foster transparency. This outcome also supported the Stakeholder Theory, which posited that firms with ISO 14001 certification possessed sustainability governance mechanisms and were expected to provide more extensive disclosures on environmental practices to enhance legitimacy and respond to stakeholders' pressure about sustainability-related concerns (Beck *et al*., 2017).

In the context of SHARIAH compliance, prior studies stated that Islam practiced law principles of good governance including the safeguarding of rights, fair treatment of shareholders, promotes transparent and managerial accountability (Abdul Latif *et al.*, 2023; Azam *et al*. 2019). From the perspective of the Stakeholder Theory, Shariah-compliant firms that operated under scrutiny to adhere to these Islamic ethical principles were more likely to respond to stakeholders' expectations by demonstrating transparency in disclosing water-related information. Thus, consistent with the Stakeholder Theory, the result holds that Shariah-compliant firms provided greater disclosure because it was expected that they were more responsive to meet stakeholder demands for ethical and environmentally responsible reporting.

Type of water sensitive sector also revealed a valuable finding on water disclosure practices in Malaysia. Regression analysis showed that the agricultural sector significantly affected the water disclosure score, as this sector was more transparent in disclosing their environmental report (p- value: $0.000 < 0.01$ significant level) rather than the healthcare sector. Thus, the study rejected the-null hypotheses. This result was consistent with studies by Wicaksono & Setiawan (2022) which stated that the agricultural sector is known to be one of the largest consumers of water resources. This is primarily due to the need for irrigation in crop cultivation and animal husbandry (Wicaksono & Setiawan, 2020).

While previous researchers have claimed that both the agricultural and healthcare sectors encountered stakeholder expectations for water sustainability (Chief *et al*., 2016; Lacroix & Megdal, 2016), the water disclosure practices were more prominent within the agricultural sector.

The higher level of water disclosure observed in the agricultural sector can be attributed to the heightened scrutiny that these firms experienced from stakeholders such as governments and customers (Zhang et al 2021). This is consistent with the Stakeholder Theory which posited that to enhance corporate reputation, firms that were subjected to stronger external pressure were more likely to engage in proactive water disclosure practices (Morris et al. 2023).

## CONCLUSION

In conclusion, this study provided significant insights into the determinants of water disclosure practices within the agricultural and healthcare publicly listed firms in Malaysia. The study found significant relationship between water disclosure, ISO 14001 certification and Shariah compliance. Similar to Handayani *et al*. (2024), firms adhering to ISO 14001 standard tended to exhibit higher levels of transparency in disclosing their environmental activities, particularly regarding water usage. In addition, shariah compliant firms disclosed more water disclosure than non-shariah compliance firms, suggesting that ESG commitments among shariah firms was vital to encourage sustainable investments and practices among Malaysian firms. This is consistent with existing literature emphasizing the importance of Shariah compliance in promoting sustainability and environmental practices (Anuar *et al*. 2009; Azam *et al*. 2019; Nugraheni & Anuar 2014,). Furthermore, the study highlighted that the water reporting practice among water sensitive sectors in Malaysia, with the agricultural sector showing greater transparency compared to the healthcare sector.

In light of these findings, it is crucial for firms to recognize the importance of disclosing their environmental management information, particularly regarding sustainable agricultural water management. Adhering to international standards, including ISO 14001, can serve as a robust framework for companies to enhance stakeholders' confidence through environmental practices (Camilleri, 2022) and consequently, improve their water disclosure practices.

Moreover, adoption of good governance practices by Shariah compliant firms contributed to transparency and improved quality of environmental

disclosure. Consistent with the Stakeholder Theory, the study underscored the significance of these practices not only for environmental sustainability but also for building trust and accountability among stakeholders.

The empirical evidence highlighted that stakeholder pressure plays a critical role in water sustainability accounting, helping to explain the influence of organizational characteristics such as 1SO 14001 certification, Shariah compliance and the water sensitivity of industries. To safeguard corporate reputation and promote transparency, companies pay greater attention to water sustainability practices (Yu *et al.,* 2020). As a recommendation, agricultural firms should prioritize and actively disclose their environmental management information to enhance sustainable agriculture water management and demonstrate commitment to good sustainability governance.

This researchwas focused on analyzing the corporate water information reporting, which is part of water accountability that related to the global water issues especially on agricultural and healthcare sectors. Future studies could explore water reporting application comprehensively across different countries. This would allow for an examination of the influence of cultural, regulatory, and economic factors on such disclosure and performance.

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