



# Impacts of stakeholder pressure on water disclosure within Asian mining companies

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Received: 22 August 2022 / Accepted: 18 January 2023  
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## Abstract

This study investigates the role of stakeholder pressure on water disclosure that is examined through the lens of managerial stakeholder theory. After reviewing the literature, we find that government, media, and international stakeholders have a higher potential to stimulate corporate water disclosure. The authors use a sample comprising 263 listed Asian mining companies from 23 countries over three years from 2017 to 2019. The authors show that these stakeholder pressures are significantly associated with water disclosure practices in Asian mining. This finding indicates that more stringent environmental regulations result in higher levels of water disclosure. Companies tend to disclose water information when corporate exposure is high, as it can attract public attention. Our findings reveal that international stakeholders are why firms create water disclosure to maintain a license to operate internationally. Although all hypotheses have been supported, further analysis shows that media exposure is insignificant in Central Asia. International stakeholders are not the drivers of water disclosure in East, West, and Central Asia.

**Keywords** Water disclosure · Mining · Stakeholder · Asia

## 1 Introduction

Climate change represents severe environmental problems. This phenomenon has raised the global average temperature that impacts water availability on Earth (Anbumozhi et al., 2012; Rankoana, 2020). Climate change will melt the glaciers; thus, sea level continues to rise (Zlatanovic et al., 2020). In addition, the warmer temperature of Earth

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gradually decreases water availability on land because the water sources (i.e., rivers and lakes) will be dry (Bates et al., 2008). It is because climate change changes the pattern of rainfall and provides prolonged drought (Fragoso & Noéme, 2018; Kahil et al., 2015; Kimuli et al., 2021).

Although all continents suffer the adverse effects, Asia is more vulnerable to climate change risks than others because of its dependence on natural resources such as water (Anbumozhi et al., 2012). Water distribution in this continent is uneven, and large areas suffer water stress. In addition, part of Asia's lands is desert, arid, and semi-arid; therefore, the drought risk is high. The decreasing rainfall trends have been observed in most countries in Asia due to climate change (Anbumozhi et al., 2012). In addition, warmer temperatures, decreasing precipitation, and higher water consumption in Asia have dried many rivers and lakes, leading to water shortages (Bates et al., 2008).

The water crisis in Asia is also linked to the rapid growth of industrialization because industrial operation negatively affects water. Mining is sensitive to water as it has a higher potential to contaminate and disappear public water sources (Burritt et al., 2016; Northey et al., 2016; Cesar & Jhony, 2021). On the other hand, water usage within the mining industry is considered insignificant; however, it represents the highest water consumer in the area where mining operates (Northey et al., 2019). Although this industry significantly drives Asian economy, mining operation contributes to decreasing water quantity and quality (Nguyen, 2021). Mining projects pollute water sources with metal hazard elements threatening human health and the ecosystem (Hazelton, 2015; Northey et al., 2019; Schornagel et al., 2012). Hence, it has brought Asia mining companies into the battle against their stakeholders (Nguyen, 2021).

Conflicts between mining and stakeholders arise from the debates that companies should be responsible for the negative impacts on water. Lodhia and Hess (2014) argue that social and environmental issues are crucial for the mining industry if stakeholder attentions are paramount. As mining has higher water risks, companies in this industry must show their commitment to using water effectively and efficiently. Then, mining companies must provide water responsibility information to their stakeholders. It is because access to water information is considered a part of human rights (Hazelton, 2013). When stakeholders can be assured of the firm's water stewardship and disclosure, corporate reputation can be maintained and enhanced (Burritt et al., 2016). However, there is no study investigating the relationship between stakeholder pressures with water disclosure in Asian mining companies. Previous studies from Burritt et al. (2016) examine the relationship between corporate characteristics with water disclosure in Japanese companies. Zhang et al. (2021) examine water reporting in companies participated in the Carbon Disclosure Project (CDP) program. Yu et al. (2020) investigate water disclosure practices in US firms and Wicaksono and Setiawan (2022) are in agriculture industry across the globe.

By applying managerial branch of stakeholder theory, we then review relevant previous studies in the literature and find that government (Eljido-Ten et al., 2010; Kumarasiri, 2017), media (Brown & Deegan, 2012; Reverte, 2009; Yunus et al., 2020), and international stakeholders (Cahaya et al., 2017; Wicaksono & Setiawan, 2022) are the significant drivers of social and environmental disclosure. This study assumes that these stakeholders have strong power and interest in environmental issues, so companies must satisfy their expectations. Furthermore, they can revoke the social contract and invite public movement to protest and blockade mining projects when companies contaminate and disappear from public water sources. Thus, this study hypothesizes these stakeholders positively influence Asian mining companies to provide water information.

Based on the data from 263 Asian publicly listed mining companies, our results indicate a positive association between stakeholder pressures and water disclosure in Asian mining companies. Mining companies are under pressure when the government release more stringent regulation; hence, they create water disclosure to show their responsibility to water. In line with our expectations, we reveal a statistically significant association between perceived pressure from media and water disclosure. We also demonstrate that the pressure from international stakeholders significantly influences mining water disclosure. Such disclosure is vital for mining companies to maintain an international social license to compete in international markets. Our main findings are robust when we change the measurement parameters of water disclosure from Burritt et al. (2016) to the guidance of Global Reporting Initiatives (GRI).

The study provides several contributions to the literature. First, our study adds the number of studies investigating corporate responses to water issues by investigating corporate water disclosure practices. Second, while previous water disclosure studies examine all industrial sectors (Burritt et al., 2016; Yu et al., 2020), we extend the literature on the association between stakeholder pressures and water disclosure by showing evidence of such a relationship in Asian mining companies. Our empirical findings suggest that the stakeholder pressures are important determinants of water disclosure in Asian mining companies.

The remainder of this paper is organized as follows. Section 2 provides the background and a literature review. Section 3 presents the theoretical framework and hypotheses development. Section 4 discusses the research methods used in this study. Section 5 reports the empirical results, and Sect. 6 presents the discussion and conclusion.

## 2 Background and literature review

### 2.1 Geographical area of Asia

Asia is the largest continent in the world, covering approximately 30 percent of the land area on Earth (National Geographic, nd). Asia is home to 4.6 billion people or 63 percent of the total population. This population has continuously increased by 40 million people annually (Worldometer, nd). This large population results in higher water demand, while the water supply in Asia is considered low and limited. Asia has only 36 percent of the world's water resources and has the lowest per capita water availability (United Nations, nd). According to the International Institute for Applied Systems Analysis (2018), people in Asia use approximately 65% of the world's water supply. It has the potential to contribute to the water crisis in Asia as well as globally. Additionally, climate change is a significant factor that gradually decreases the amount of water supply in Asia.

Geographically Asia has several deserts, many of them in Central Asia. Desert and semi-desert areas cover over 50 percent of Central Asia's land (Feng et al., 2022). Furthermore, approximately one-third of the world's drylands are in Central Asia (Bai et al., 2012; Karthe et al., 2017). It is the driest region in the world (Huang et al., 2021; Karthe et al., 2017). Water in this area is highly dependent on rivers such as the Amu Darya and Syr Darya. However, the current water supply from rivers has shrunk significantly owing to unscrupulous exploitation (Feng et al., 2022). Other regions in Asia have also experienced water crisis, and more than 100 million people in Southeast Asia live without access to clean water (Geall, 2019). The total amount of water in South Asia is also decreasing due

to the population growth in this region and climate change (Rasul, 2014). Hence, South Asian countries face the challenge of satisfying the growing demand for water, while the water sources have slowly disappeared (Rasul, 2016).

## 2.2 Literature review

The concept of corporate social responsibility (CSR) is about the obligation of business to society and the environment. In this twenty-first century business paradigm, sustainable development is essential, proposed by the government or authority as a solution to many problems (Elkington, 1997). In Asia, some governments actively promote CSR that encourages firms to be responsible to society and the environment (Sharma, 2013). The government of Indonesia, through Act No. 40/2007, stated that natural-based firms must allocate their funds for CSR programs. In 2006, Shenzhen Stock Exchange released a set of social responsibility guidelines for Chinese listed companies. The Ministry of Corporate Affairs of India introduced voluntary CSR guideline in 2009 although it was considered mandatory in 2011 (Sharma, 2013). Similar to Asia, the European Parliament, in April 2014, adopted provisions requiring companies to disclose information on social and environmental aspects, in addition to financial reports (Masse, 2014). In some African countries, CSR activities are dominated by philanthropic responsibility (Cheruiyot & Onsando, 2016). However, African countries' governments change the conception of CSR from corporate charity to comprehensive business management that respects human rights and the environment (Amodu, 2020). Several government agencies in the United States of America employ CSR programs to provide corporate guidance on human rights, energy and the environment (Camilleri, 2017).

These active global government roles are addressed to maintain environmental sustainability, including water, from business' negative impacts. Because all countries around the globe suffer water problems from business operations, government regulation encourages companies to be transparent regarding water stewardship. On the other hand, numerous researchers acknowledge the importance of water disclosure as there is a call for greater accountability and transparency related to water stewardship activities. Hazelton (2013) suggests that access to water information constitutes a human right. Lambooy (2011) finds that water reporting becomes a trend among companies where different industries have different impacts on water. This study explains that difficulties arise when a company operates in an area with weak governance. Moreover, corporate responsibility practices are increasing in areas with lower levels of water availability. Askham (2019) reports a positive trend of water reporting in food companies in South Africa. Water scarcity in this region calls for companies to recognize the importance of water conservation. However, there is a tendency for water disclosure to be created under the pressure of acute drought conditions (Egan et al., 2015).

Previous studies provide the evidence that stakeholders' power strongly influences corporate social and environmental disclosure practices (Cahaya et al., 2016; Kamal, 2021; Qu et al., 2013; Sari et al., 2021). Stakeholder power refers to the ability of a stakeholder group to influence corporate decisions (Nyahas et al., 2018). The ability of a stakeholder to influence a company is viewed as a function of the degree of control over corporate resources (Roberts, 1992; Ullmann, 1985). Hazelton (2013) argues that realizing the human right to water information can be achieved by promoting and developing stakeholder influence. Burritt et al. (2016) investigate the determinants of water disclosure in Japanese companies and find that organizational size, industry water sensitivity, and ownership concentration

correlate significantly with water disclosure. Yu et al. (2020) examine stakeholder influence on water disclosure in 347 US companies and find that creditor is a significant driver of water disclosure. When a company has a higher dependence on financial loans, water disclosure is produced to respond to creditor interests, such as water risks. They also find that larger shareholders are more concerned about image, reputation, and water issues. However, Yu (2022) explains that government ownership is not a significant driver of water disclosure although it is a largest shareholder. Previous studies also provide evidence that high-risk industries disclose more water information than others (Burritt et al., 2016; Yu et al., 2020; Yu, 2022; Zhang et al., 2021). Wicaksono and Setiawan (2022) find that stakeholder pressures significantly influence water disclosure in the agriculture industry, which is the highest water-using industry in the world. As there is some consensus that stakeholder pressures are influential in the production of water disclosure and there is no research investigating such disclosure in mining, there is a need to investigate water disclosure practices in mining sector.

Mining activities affect water because it heavily uses water that can deplete surface and groundwater supplies (Cesar & Jhony, 2021). In addition, it pollutes water from discharged mine effluent. Four types of water pollution from mining decrease water quality (Safe Drinking Water Foundation, nd). First is Acid Mine Drainage, where acid from mining is carried off the mine location by rainwater or surface drainage and contaminated water stream nearby streams, lakes, rivers, and groundwater. Heavy metal contamination happens when metal elements from mining (such as arsenic, cobalt, copper) are in contact with water (United States Geological Survey, nd). Processing chemical pollution occurs when chemical materials leak, spill, or leach from the mine site. Last is erosion and sedimentation when the mining development disturbs soil and rock. Due to the negative impacts on water and the environment, it is unsurprising that there are many protests and blockades from stakeholders (Northey et al., 2016; Prno & Slocombe, 2012). In extreme cases, these lead to the temporary or permanent interruption of mining operations (Cesar & Jhony, 2021). For instance, a mining company is not allowed to operate in a region in India because the company not only destroys their homes but also causes water scarcity. People around the company have not received compensation as their welfare is reduced (Greenpeace India, 2013). Another example shows that Indonesian mining activities poison water sources for society, leading to many complaints because it makes the land arid and causes a water crisis in mining locations (Greenpeace Indonesia, 2016).

### 3 Theoretical framework and hypotheses

#### 3.1 Stakeholder theory

This study is anchored in stakeholder theory, which has been used in numerous social and environmental research (Ching & Gerab, 2017; Gaia & Jones, 2017; Kaur & Lodhia, 2018; Liesen et al., 2015; Rashid et al., 2020; Yunus et al., 2020). This theory concerns managing a company effectively and how business can be described through stakeholder relationships (Yunus et al., 2020). The basis of stakeholder theory is how companies maintain good relationships with their stakeholders by satisfying their demands (Roberts, 1992; Ullmann, 1985). A business is expected to perform particular activities that stakeholders expect and report to them (Guthrie et al., 2004). Under this theory, organizational behavior can be predicted by the varied stakeholder relationships and their influence on firm decisions (Yunus

et al., 2020). It also suggests that organizations must understand and satisfy various stakeholder expectations. However, scholars debate whether companies should pay attention to all stakeholders or focus on various stakeholder groups (Nyahas et al., 2018). This debate results in two stakeholder theory branches: managerial or positive and normative or ethical. First, the normative or ethical branch encourages companies to treat all stakeholders fairly as a moral obligation (Guthrie et al., 2004; Nyahas et al., 2018). Then, the interests of all stakeholders are taken into account in the decision-making process, and information must be provided even if stakeholders do not use this information (Burritt et al., 2016; Ratana-jongkol et al., 2006).

Second, the managerial or positive branch elucidates that managers can practically not meet the demands of an unlimited list of stakeholders; therefore, the company only prioritizes influential stakeholders. It is important to pay attention to important stakeholders because the success and survival of public organizations depend on satisfying their demands (Bryson, 2004). Ullmann (1985) argues that stakeholders with higher power are the basis of firm performance. The manager should satisfy influential stakeholder demands if a stakeholder controls a company's important resources. Further, the request from a stakeholder is ignored when stakeholder power is weak. Additionally, the company must be accountable to stakeholders who have an economic impact on the company (Lu & Abeysekera, 2014; Salehi et al., 2017).

The managerial branch allows a company to identify which stakeholders are important to the organization. The stakeholder identification process is based on the degree to which stakeholders influence management decisions. Stakeholder salience provides three attributes to define a stakeholder degree: power, legitimacy, and urgency (Mitchell et al., 1997). Stakeholder power refers to the stakeholder's ability to influence management decisions based on the control of resources. Hence, managers tend to respond to the concerns and expectations of stakeholders who have higher power (Dibia & Onwuchekwa, 2015). Bryson (2004) provides the grids that, based on their power, stakeholders can be company supporters or opponents. A stakeholder is a strong supporter if it has high power and support, whereas a stakeholder is a strong opponent if it provides high power and an opponent. Bryson (2004) also presents the "power versus interest" grids of stakeholders that typically help determine which stakeholder bases must be considered to address the issues and problems. It results in four stakeholder categories: players consist of stakeholders with an interest and significant power, subjects who have an interest but little power, context setter who has power but little interest, and crowd who have little power and interest.

This study adopts managerial branch of stakeholder theory. Hence, we need to identify stakeholder groups that present higher pressures to the company. After reviewing relevant studies, we conclude that government, media, and international stakeholders are powerful stakeholders interested in environmental issues and CSR. Because mining significantly impacts water quantity and quality (Gilsbach et al., 2022), these stakeholder groups press mining companies to show water stewardship activities and produce water disclosure. Consequently, this study develops the hypothesis for these three stakeholder groups.

### 3.2 Regulation stringency

Scholars have shown that the government or regulator is a significant driver of corporate responsibility practices due to its regulations and laws (Alotaibi & Hussainey, 2016; Habbash, 2016; Roberts, 1992). Environmental regulation provides a source of pressure by which businesses can be coerced to implement environmentally sustainable practices

(Christ, 2014). If environmental regulation becomes more stringent, businesses must adopt a strategy to tackle environmental issues. Additionally, firms must engage in proactive actions to reduce the environmental impact, such as preventing water disasters. For instance, China regulates water use through the Water Law of 1988. This law is enacted to protect water, prevent water disasters, and support economic and social development (Zhang et al., 2021). In Indonesia, water is controlled by the government, and water usage is addressed to achieve social welfare. Hence, water users in Indonesia are regulated to be responsible for using water efficiently. Following the call for accountability and transparency regarding environmentally sustainable activities, water disclosure practices are becoming important for corporations (Burritt et al., 2016). Because mining companies negatively impact water quality and quantity, we conjecture that mining companies are under pressure to comply with the regulations so that water disclosure is produced. Therefore, this study proposes the following hypothesis:

**H1** There is a positive relationship between regulation stringency and water disclosure in Asian mining companies.

### 3.3 3.3. Media exposure

As the mining sector provides a lot of negative impacts on the environment, including water (Northey et al., 2016), it can be said that every single mining operation receives a lot of attention from the media. The media can shape public expectations for companies and play an important role in mobilizing social movements (Burritt et al., 2016). The media can reveal information about a company previously not understood by the public (Islam & Deegan, 2011). Higher media exposure raises company's visibility that invites further public scrutiny, attention, and pressure (Reverte, 2009). Additionally, the media potentially provides a legitimacy gap for the company when it releases an article about the firm related to the environmental impact of business operations. Several mining companies in Asia are impacted by broadcasting news and social networks. These make the mining project is stagnated and lead the company into conflicts with stakeholders (Nguyen, 2021). Accordingly, we expect greater media attention to influence the manager's decision to create water disclosure. Hence, the following hypothesis is tested:

**H2** There is a positive relationship between media exposure and water disclosure in Asian mining companies.

### 3.4 International stakeholders

A company decides to operate multi-nationally to increase efficiency and profitability, providing flexible and better access to resources (Ohene-Asare et al., 2017; Paiva & Vieira, 2009). Because the economic, cultural, regulatory, and political situations may differ across nations, resulting in more complex social issues faced by the companies (Hanifa & Cahaya, 2016). When companies operate internationally, the list of corporate stakeholders increases, so companies must consider the demand and expectations of international stakeholders. In terms of mining companies, mining projects potentially increase international water demand and decrease water quality. Then, international stakeholders press companies to be responsible for the negative impacts. If mining fails to satisfy international stakeholders, the international mining license will likely be revoked. Hence, corporate disclosure

practices are important for maintaining legitimacy to survive in the international arena (Higgins & Larrinaga, 2014). This study assumes that mining company receives pressure from international stakeholders to be responsible for water impacts. Therefore, this study hypothesizes the following:

**H3** There is a positive relationship between international stakeholders and the water disclosure for mining companies.

## 4 Research method

### 4.1 Sample

This study uses all mining companies in Asia as the research sample. The data collection process is divided into two stages. In the first stage, this study used a data stream to obtain a list of mining companies in Asia. This study only focuses on listed mining companies because they are more regulated than unlisted firms in corporate reporting practices. It indicates that listed companies provide more refined data than non-listed companies (Cahaya et al., 2017). The final list covers 263 mining companies from 23 Asian countries which is presented in Table 1. This study downloads annual and/or sustainability reports to collect data in the second stage. This study uses company reports from 2017 to 2019 for the data sources. The main reason we choose 2017 to 2019 is that this study is addressed to investigate corporate water performance after the announcement of the Sustainable Development Goals (SDGs) in 2015 by the United Nations (Bebbington & Unerman, 2018).

**Table 1** Sample distribution

Country	Total firm(s)	Country	Total firm(s)
<i>Southeast Asia</i>			
Indonesia	31	Singapore	5
Malaysia	2	Thailand	10
Philippines	13	Vietnam	34
<i>East Asia</i>			
China	54	South Korea	1
Hong Kong	2	Taiwan	2
Japan	4		
<i>South Asia</i>			
Bangladesh	1	India	49
Bhutan	1	Pakistan	5
<i>Central Asia</i>			
Kazakhstan	11	Uzbekistan	2
Mongolia	11		
<i>West Asia</i>			
Saudi Arabia	2	Kuwait	1
Bahrain	1	Oman	3
Iran	18		
TOTAL: 263			



## 4.2 Dependent variable—water disclosure

Water disclosure is presented in this study as the dependent variable. This variable is measured by the total of water parameter that is disclosed by company in the annual and/or sustainability report. We adopt water disclosure guideline from Burritt et al. (2016) as a benchmark of water disclosure. This guideline consists of 24 water parameters which is presented in Appendix 1. To obtain the data, we first carefully read the corporate water-related disclosure presented in annual and/or sustainability reports to obtain the data. We then match water information disclosed in company reports with the water disclosure parameter. As this study considers an unweighted score for a water disclosure parameter, it implies that each parameter in the water guideline is equally important. The value of 1 is given if business discloses a water parameter and 0 otherwise (Burritt et al., 2016; Yu et al., 2020). We also conduct a Cronbach's alpha test to evaluate the reliability and internal consistency of the parameters included in the checklist. The Cronbach's alpha coefficient for the checklist is 0.81; thus, it is considered reliable (Sekaran & Bougie, 2016).

## 4.3 Independent variables

*Regulation stringency.* The pillar of environmental sustainability (pillar 9) consists of the stringency of the government's environmental regulations and the variable assessing water status. Environmental stringency scores from the Travel & Tourism Competitiveness Report released by the World Economic Forum (WEF) are adopted to measure this variable. The score of environmental stringency ranges from 1 to 7, where 1 is very lax and 7 is the most stringent.

*Media exposure.* This variable is measured by the total number of media articles referring to the firm regarding environmental issues (Yunus et al., 2020). Our study counts all articles from local and international media which are available on the internet from 2017 to 2019. This study employs a web-based search engine on the internet and enters the company name as a keyword. We then activate the filter feature to find articles released in each examination year. We also use translation engine from Google to translate articles that are not written in English or Bahasa. We only count articles that discuss company's environmental issues.

*International stakeholders.* This variable represents international stakeholders directly or indirectly affected by firm activities when they operate internationally. This study defines international stakeholders as those living in countries where the company operates internationally but do not hold any companies' shares. Sari et al. (2021) and Hanifa and Cahaya (2016) measure international stakeholders based on the coverage of firm operations, whether a company operates internationally or nationally. Following these previous studies, the pressure of international stakeholders is represented by a dichotomous variable, where a value of 1 if the company operates internationally and 0 if the company operates nationally.

## 4.4 Control variables

In addition to the explanatory variables, several variables are theoretically related to corporate social disclosure. According to the literature, company characteristics can affect corporate disclosure. Therefore, this study involves corporate characteristics as control variables that is widely used by scholars to discuss social and environmental disclosures. All

control variables are included in the regression model to avoid model misspecification and diminish the probability of bias in the results (Zaid et al., 2020).

First, this study controls the size of the company because larger companies tend to disclose more information related to CSR (Qa'dan & Suwaidan, 2019). Firm size is measured by calculating the natural logarithm of the total assets (Huafang & Jianguo, 2007). Second, this study controls the leverage ratio because companies that depend on debt are expected to make social disclosures (Lu & Abeysekera, 2014). Leverage is calculated as total debt divided by total assets (Ullah et al., 2019). Third, this study introduces a firm's profitability in the research model, as profitable firms with strong financial performance disclose more information (Alnabsha et al., 2018). Profitability is measured using return on assets (ROA), calculated as the ratio of net income divided by total assets (Habbash, 2016). Finally, this study involves firm age because older companies are expected to engage significantly in CSR activities to maintain their reputation (Roberts, 1992). Firm age is measured by the total number of years since its inception.

#### 4.5 Model specification

The following multiple regression model is estimated to examine the hypotheses developed regarding the link between stakeholder pressure and water disclosure in Asian mining companies:

$$WDI_{it} = \beta_0 + \beta_1 STR_{it} + \beta_2 MXP_{it} + \beta_3 IOP_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 PRF_{it} + \beta_7 AGE_{it} + \varepsilon,$$

where WDI is the water disclosure index; STR is the stringency of environmental regulation of the country; MXP is the total number of articles related to the company published in media; IOP is a dummy variable for international operations, 1 if the company operates internationally, and 0 otherwise; SIZE is the natural logarithm of total assets; LEV is the leverage ratio, and PRF is the return on assets. AGE is the total number of years since firm inception,  $\beta_0$  is the constant,  $i$  represents the company,  $t$  describes the year,  $\beta_1$  to  $\beta_7$  are the regression coefficients, and  $\varepsilon$  describes the error.

## 5 Results

### 5.1 Descriptive statistics

Table 2 summarizes the descriptive statistics of all variables in the research model. The mean value of the water disclosure index is 0.102, from a minimum score of 0 to a maximum score of 0.5. It indicates that the water disclosure level is still low, and the variation of disclosure items among companies is considered high (standard deviation = 0.105). Environmental stringency has a mean value of 3.837 with a minimum value of 2.7 and a maximum value of 5.8. It shows that the level of environmental stringency from the government in Asian countries is considered medium to high. It can be said that this regulation can press a company toward responsibility performances to comply with the regulation. Media exposure is ranged from a minimum score of 0 to a maximum score of 81, with a mean of 3.181. It implies that the mining industry receives more attention from the media because the visibility of mining companies is increasing. In terms of categorical variables, in our sample, 26.36 percent of mining companies operate internationally, and the remaining companies operate nationally. The mean values for the control variables, namely

**Table 2** Descriptive statistics

Panel A: Continuous variable					
Variable	Obs	Mean	Min	Max	Std. deviation
Water disclosure index	789	0.102	0	0.5	0.105
Environmental stringency	789	3.837	2.7	5.8	0.510
Media exposure	789	3.181	0	81	4.945
Firm size (in a million)	789	1,894,007	5,050	228,820,628	1,177,579
Leverage	789	0.623	0	47.84	1.959
Profitability	789	5.337	-99.91	73.690	16.414
Firm age	789	29.313	1	111	16.792
Panel B: Categorical variable					
Variable	Obs	Percentage			
<i>International operation</i>					
Company operates internationally	207	26.36			
Company operates nationally	582	73.64			

**Table 3** Correlation analysis

	WDI	STR	MXP	MOP	SIZE	LEV	PRF	AGE
WDI	1							
STR	0.095***	1						
MXP	0.201***	0.074**	1					
IOP	0.309***	0.217***	0.218***	1				
SIZE	0.078**	-0.312***	-0.082**	-0.061*	1			
LEV	-0.037	-0.033	0.018	-0.071*	-0.066*	1		
PRF	0.090**	-0.046	-0.037	0.156***	0.173***	-0.026	1	
AGE	0.140***	-0.158	0.011	-0.121***	0.128***	0.012	-0.001	1
<i>Multicollinearity</i>								
Tolerance		0.728	0.969	0.726	0.817	0.988	0.969	0.953
VIF		1.374	1.032	1.378	1.224	1.012	1.032	1.049

WDI=water disclosure index; STR=stringency of environmental regulation; MXP=media exposure; IOP=international operation; SIZE=firm size; LEV=leverage; PRF=firm profitability; AGE=firm age. \*, \*\*, \*\*\*, represent significance at 10%, 5%, and 1%, respectively

firm size, leverage, profitability, and firm age, are 1,894,007; 0.623; 5.337; and 29.313, respectively.

### 5.2 Bivariate analysis

Table 3 presents the correlation matrix of the examined variables. The water disclosure index is positively correlated with the stringency of environmental regulation ( $\rho=0.095$ ). The water disclosure index is also positively correlated with media exposure ( $\rho=0.201$ ) and international operations ( $\rho=0.309$ ). In terms of control variables, the water disclosure

index has a positive relationship with firm size ( $\rho=0.078$ ), profitability ( $\rho=0.090$ ), and firm age ( $\rho=0.140$ ). However, there is a negative association between the disclosure index and leverage ( $\rho=-0.037$ ).

This study also ensures that there is no multicollinearity problem between the predictor variables. Therefore, the checking process uses three indicators: the correlation matrix, variance inflation factor (VIF), and tolerance value. According to Gujarati (2004), the correlation coefficient between the regressors is high if the coefficient has a value greater than 0.8. In addition, serious multicollinearity problems occur when the value of tolerance is lower than 0.10 and the VIF score is higher than 10 (Sekaran & Bougie, 2016). Table 3 shows no correlation coefficient between regressors above 0.8, so there is no multicollinearity problem. Additionally, each variable in this study has a tolerance value greater than 0.10 and a VIF score smaller than 10. It can be said that no serious multicollinearity problem occurred in this study.

### 5.3 Panel regression results

Table 4 reports the regression results based on random effect model as p-value of Hausman test shows an insignificant result. This study first tests each independent variable and the control variables to gain knowledge of the original effect of the independent variable. The results are presented in Table 4 in column M1 to M3. Subsequently, we examine all variables in research model documented in column M4. To ensure that our research model is robust, we change the measurement of the dependent variable with water parameters released by GRI. It is because GRI guidelines have been recognized and implemented by

**Table 4** Panel regression result

Variable	M1		M2		M3		M4	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
STR	0.023	0.000***					0.013	0.020**
MXP			0.003	0.000***			0.002	0.000***
IOP					0.060	0.000***	0.051	0.000***
SIZE	0.002	0.019**	0.001	0.089*	0.002	0.042**	0.002	0.003***
LEV	-0.003	0.466	-0.004	0.296	-0.001	0.748	-0.001	0.740
PRF	0.001	0.025**	0.001	0.014**	0.001	0.441	0.001	0.283
AGE	0.001	0.000***	0.001	0.000***	0.001	0.000***	0.001	0.000***
R <sup>2</sup>	0.051		0.075		0.135		0.159	
F-Stat	8.118		12.395		23.854		20.355	
Prob. (F.stat)	0.000***		0.000***		0.000***		0.000***	

Column M1 reflects the regression results for the STR and control variables. Column M2 presents the results of the analysis of the MXP and control variables. Column M3 documents the regression coefficients for the model involving the MOP and control variables. Column M4 reports the regression results for the model that includes all the examined variables

*WDI* Water disclosure index measured by water parameters from Burrit et al. (2016); *STR* stringency of environmental regulation; *MXP* media exposure; *MOP* international operation; *SIZE* firm size; *LEV* leverage; *PRF* firm profitability; *AGE* firm age

\*, \*\*, \*\*\* represent significance at 10%, 5%, and 1%, respectively

many companies worldwide (Fernandez-Feijoo et al., 2014). The regression results for the robustness check are presented in Table 5.

## 5.4 Regulation stringency and water disclosure

In H1, we hypothesize a positive relationship between environmental regulation stringency and water disclosure. Column M1 of Table 4 shows a positive relationship between environmental stringency and water disclosure ( $\beta=0.023$ ,  $p<0.01$ ). The result indicates that the more stringent the environmental regulation in a country results the higher the level of water disclosure.

By changing the measurement of water disclosure, column M1 findings of Table 5 reveal the same result as Table 4 ( $\beta=0.076$ ,  $p<0.01$ ). It suggests that this result is robust and is not sensitive to the water disclosure guidelines. Hence, both column M1 of Table 4 and Table 5 findings supports the sign proposed in H1. These findings are consistent with Zhang et al. (2021) that report a positive relationship between environmental stringency and water disclosure.

The first finding suggests that the stringency of government regulation will drive the production of corporate water disclosure in mining companies in all Asian regions. Undoubtedly, the government plays an important role in protecting the environment as it can release regulations to regulate business operations, including mining activities. The purpose of releasing environmental regulation is not merely to manage business operations to be environmentally friendly but also to achieve social welfare and protect the planet from disasters such as water crises. Because mining significantly impacts water quantity and quality in Asia (Nguyen, 2021), more stringent regulation represents higher pressure,

**Table 5** Robustness check

Variable	M1		M2		M3		M4	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
STR	0.076	0.000***					0.038	0.062**
MXP			0.015	0.000***			0.010	0.000***
IOP					0.216	0.000***	0.182	0.000***
SIZE	0.006	0.063*	0.004	0.175	0.005	0.104	0.007	0.016**
LEV	-0.013	0.337	-0.016	0.205	-0.007	0.582	-0.001	0.552
PRF	0.002	0.019**	0.002	0.001***	0.001	0.370	0.001	0.225
AGE	0.004	0.000***	0.003	0.000***	0.004	0.000***	0.004	0.000***
R <sup>2</sup>	0.063		0.097		0.148		0.173	
F-Stat	10.185		16.366		26.465		22.566	
Prob. (F.stat)	0.000***		0.000***		0.000***		0.000***	

Column M1 reflects the regression results for the STR and control variables. Column M2 presents the results of the analysis of the MXP and control variables. Column M3 documents the regression coefficients for the model involving the MOP and control variables. Column M4 reports the regression results for the model that includes all the examined variables

*WDI* Water disclosure index measured by GRI guidelines; *STR* stringency of environmental regulation; *MXP* media exposure; *IOP* international operation; *SIZE* firm size; *LEV* leverage; *PRF* firm profitability; *AGE* firm age

\*, \*\*, \*\*\* represent significance at 10%, 5%, and 1%, respectively

so managers are coerced to comply with such regulations. It means that stricter regulation challenges mining companies to create a strategy to manage the impact on water. The absence of water management will put mining projects in trouble, and criminal sanctions can be gifted when mining pollutes the water without any license (Lambooy, 2011). Therefore, water stewardship activities are becoming crucial to fulfill the government or regulation expectations stipulated in the regulation. Corporations devote their energy and resources to ensuring that mining projects have no serious negative impacts on water. Water disclosure is then produced to communicate water stewardship activities to the government as a form of mining compliance with the regulation.

## 5.5 Media exposure and water disclosure

For the second hypothesis, we propose a positive association between media exposure and water disclosure. In column M2 of Table 4, media exposure has positive and significant relationship to water-related disclosure ( $\beta=0.003$ ,  $p<0.01$ ). It implies that companies with higher exposure to media tend to disclose more water information. Column M2 findings of Table 5 document the consistent result ( $\beta=0.015$ ,  $p<0.01$ ). Thus, these results confirm the sign proposed in second hypothesis. Although this study finds that media exposure positively and significantly drives water disclosure, it contradicts Burritt et al. (2016) that find an insignificant relationship between media exposure and water disclosure.

Our finding interestingly does not support the proposition that media is a secondary stakeholder group that is not prioritized by the company (Clarkson, 1995). Media nowadays plays a more active role by choosing stories for reporting and framing the corporation to reflect media values (Reverte, 2009). As climate change, prolonged drought, and water crisis are among the serious environmental problems in Asia and mining projects have a significant negative impact on water, these attract greater attention from the media. It will then actively release articles regarding environmental (water) issues from mining activities. In today's digital era, society can more easily receive any information from the media because its articles can be accessed online. It makes the pressure from the media looks strong, causing mining companies to respond to this pressure. Hence, managers of mining companies decide to make water disclosure to prevent protests and negative social movements that threaten corporate reputation and image.

## 5.6 International operation and water disclosure

This study proposes the hypothesis that there is a positive relationship between international operation and water disclosure. The regression result in column M3 of Table 4 shows that international operation of Asian mining companies is positively and significantly associated with water disclosure ( $\beta=0.060$ ,  $p<0.01$ ). This result is confirmed by robustness check in column M3 of Table 5 that reveals consistent finding ( $\beta=0.216$ ,  $p<0.01$ ). Hence, we can conclude that the third hypothesis is supported. Our result is consistent with prior research by Cahaya et al. (2017) that find companies with international operation tend to disclose more sustainability information because they receive pressures from international stakeholders.

Our finding indicates that water disclosure is addressed to deal with the pressure of international stakeholders, especially stakeholders from the country when company operates internationally. Because mining has the potential to increase international water demand and reduce international water quality, international stakeholders focus

on making sure that mining project uses water efficiently without contaminating water sources with hazardous elements. Hence, the pressures from international stakeholders on the companies exist so that they face new challenges and pressures to devote their concern to sustainability issues (Cahaya et al., 2017). A company with international operation should be adaptive due to the differences in regulation and culture between home country and other countries. Mining companies use water disclosure to satisfy the expectations and demands from international stakeholders in order to compete in the international market (Higgins & Larrinaga, 2014).

In the case of control variables, this study finds that firm size positively and significantly affects water disclosure. We find that leverage is not an important driver of water disclosure. Our findings indicate that creditor power is not associated with water disclosure. The regression result documents that companies with strong financial performance are more likely to share water information. Our last control variable, namely firm age, has a positive coefficient, suggesting that older companies are expected to engage significantly in water stewardship and disclosure.

## 5.7 Further analysis

This study provides further analysis by testing the research model based on the sub-Asian regions of Southeast Asia, East Asia, South Asia, West Asia, and Central Asia. Table 6 presents the regression results for the Asian regions with the detail as follows. It can be seen that there is positive and significant association between environmental stringency and water disclosure in all sub-Asian regions. This result implies that Asian countries have stringent regulation regarding environment so that mining companies are under pressure to show their commitment to preserve the environment including water.

Media exposure positively and significantly affects water disclosure in Asia, except in Central Asia ( $\beta = -0.009$ ,  $p > 0.1$ ). This finding is interesting because Central Asia is the driest region in the world, and the water crisis directly limits sustainable development (Huang et al., 2021; Karthe et al., 2017). A possible reason is that disclosure practices in Central Asia highly depend on political and economic issues (Smirnova, 2012); however, the concept of CSR is emerging in this region (Qa'dan & Suwaidan, 2019). Hence, the pressure from media is likely to be ignored because satisfying the pressure from media is not companies' main priority.

The relationship between international stakeholders and water disclosure is positive and significant in Southeast Asia ( $\beta = 0.005$ ,  $p < 0.01$ ) and South Asia ( $\beta = 0.007$ ,  $p < 0.01$ ). It is because mining companies from these regions are considered as the largest mining companies in Asia (Humphreys, 2018; Nguyen, 2021). Many mining firms of South and Southeast Asia operate internationally, while many mining firms from other sub-Asian regions operate nationally. When mining companies operate internationally, they use international water sources and potentially contaminate them with hazard elements from their waste. Hence, mining companies from South and Southeast Asia receive a lot of pressures from international stakeholders to take into account their impacts to water quantity and quality. The higher level of water disclosure is then produced to satisfy the pressures and demands from international stakeholders (Potluri et al., 2010; Oh et al., 2011; Li et al., 2016; Qa'dan & Suwaidan, 2019; Ismael & Zakaria, 2020).

**Table 6** Regression results for Asian regions

Variable	Southeast Asia		East Asia		South Asia		West Asia		Central Asia	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
STR	0.042	0.000***	0.018	0.088*	0.039	0.006***	0.001	0.047**	0.014	0.022**
MXP	0.001	0.071*	0.014	0.000***	0.005	0.003***	0.001	0.065*	-0.009	0.288
IOP	0.005	0.000***	-0.002	0.685	0.007	0.003***	-0.000	0.940	0.021	0.520
SIZE	0.003	0.057*	0.006	0.005***	0.012	0.000***	-0.000	0.202	0.013	0.038**
LEV	0.026	0.174	-0.005	0.842	0.001	0.836	0.004	0.669	-0.057	0.123
PRF	0.001	0.000***	0.000	0.592	0.001	0.018**	-0.000	0.633	0.001	0.317
AGE	0.001	0.002***	-0.001	0.049**	0.000	0.141	0.000	0.250	-0.001	0.063**
R <sup>2</sup>	0.211		0.333		0.3784		0.2312		0.3803	
F-Stat	10.338		12.892		13.132		2.879		4.471	
Prob	0.000***		0.000***		0.000***		0.011***		0.000***	

WDI Water disclosure index measured by water parameters from Burritt et al. (2016); STR stringency of environmental regulation; MXP media exposure; IOP international operation; SIZE firm size; LEV leverage; PRF firm profitability; AGE firm age

\*, \*\*, \*\*\* represent significance at 10%, 5%, and 1%, respectively



## 6 Conclusion

This study is conducted to provide empirical evidence regarding the relationship between stakeholders pressures and water disclosure in Asian mining companies. Asian mining sector significantly contributes to many environmental damages including the decreasing of water quantity and quality (Gilsbach et al., 2022; Nguyen, 2021; Northey et al., 2016). They successfully invite stakeholders' attention to scrutinize mining activity and actively influence mining to show their commitment regarding water issues. We focus on the pressures faced by mining firms from several influential stakeholders. Therefore, our hypothesis is anchored by managerial stakeholder theory that company's disclosure is produced to manage stakeholders expectations.

This study reveals that Asian mining firms are facing potential pressures from their stakeholders such as regulator, media, and international stakeholders. Our results show that the pressures from those influential stakeholders are significantly associated with water disclosure. It shows that companies use water disclosure in order to respond the stakeholders' demands and pressures. Our findings support managerial stakeholder theory that posit companies attempt to satisfy demands from influential stakeholders in order to maintain their survival. Water disclosure practices are considered efficient to avoid sanctions from government, negative news from media, and protests or blockades from international stakeholders. Our further analysis documents that the relationship between government and water disclosure is significant in all subregions in Asia. In terms of media pressures, except Central Asia, it is significantly associated with water disclosure in Asia regions. International operation is only significant in Southeast and South Asia.

Our study offers several implications. First, our findings indicate that the achievement of sustainable development in Asian mining needs an active role from the stakeholders. As water quantity and quality in Asia gradually decrease, stakeholder pressure is an alarm that is expected to wake up manager awareness of the importance of environmental preservation, including water sustainability and disclosure practices. Second, in terms of companies, identification and management of stakeholder interests are important for companies as firms currently cannot focus only on stakeholder that is considered influential. Our findings imply that water disclosure is not merely about satisfying the pressures from primary stakeholders such as the government but also about considering the pressures from secondary stakeholders such as the media (see Clarkson (1995) for stakeholder classification). Therefore, our study suggests managers better understand stakeholder expectations and all the forces shaping corporate water disclosure. Third, from a public perspective, the government can adopt a stakeholder-driven to mitigate corporate impacts on the water, as our findings show that stakeholder pressures influence water disclosure. The government is then suggested to release regulation that enhances firms' transparency regarding water stewardship activities via water disclosure.

This study has several limitations. First, this study only analyzes water disclosure practices in the listed mining companies in Asia due to the limited access to non-listed mining firms in Asia. However, we recognize that non-listed mining firms have the potential to harm the environment, although they are not included in our study. Future research is expected to investigate water disclosure practices in all listed and non-listed mining companies to better capture stakeholders' effect on water disclosure in mining. We also suggest future studies to investigate all water-sensitive industries to provide more comprehensive evidence. The industry, which is considered sensitive, can be seen in Burritt et al. (2016) and Zhang et al. (2021). Second, this research is based on managerial stakeholder theory;

thus, this study only selected variables representing influential stakeholders. We recognize that there are other external stakeholder groups (such as NGOs, societies, communities) that have the potential to influence management decisions regarding environmental issues actively. Future studies may need to examine the relationship between all stakeholder groups and water disclosure. It is better if internal stakeholders are included in the investigation. Third, this study recognizes that not all companies produce sustainability reports. Corporate annual reports may not provide detailed information on responsibility activities, including water. Further research can consider other corporate disclosure platforms as data sources, such as websites, to capture more water-related information.

## Appendix 1. Water-related disclosure parameters

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### Measure water use

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Assess water risk  
 Consult stakeholders  
 Engage supply chain  
 Water statement/policy  
 Water goals and targets  
 Quantitative target  
 Target water use  
 Target wastewater  
 Best available technology  
 Water risk in decision-making  
 Measure and report performance  
 Report freshwater use  
 Report wastewater quality  
 Report wastewater volume  
 Report water recycling  
 Report in absolute value  
 Report in normalized value  
 Trends reporting  
 Regional/facility-based reporting  
 Use GRI  
 Strategic partnership  
 Continuous improvement  
 Third party audit of water data

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*Source:* Burritt et al. (2016)

**Glossary** Global Reporting Initiative (GRI): GRI is a provider of sustainability standards; Corporate social responsibility (CSR): The obligation of a firm to use its resources in ways to benefit society, through committed participation as a member of society, taking into account the society at large and improving welfare of society at large, independent of direct gains of the company (Gunawan, 2015); Stakeholder: Any group or individual who can affect or is affected by the achievement of the firm's objectives (Roberts, 1992); Stakeholder theory: An organization's management is expected to take on activities expected by their stakeholders and to report on those activities to the stakeholders (Guthrie et al., 2004).; Normative (ethical) stakeholder theory: Management has a fiduciary relationship with all stakeholders as such should endeavor to treat every

stakeholder equally as an ethical responsibility for the optimal benefit of both the firm and its stakeholders (Nyahas et al., 2018); Managerial (positive) stakeholder theory: Managers should pay attention to a limited group of stakeholders who are crucial for the attainment of organizational goals (Nyahas et al., 2018); Regulation stringency (STR): The level of stringency of government's environmental regulation in a country; Media exposure (MXP): Any news about a company in mass media; International operation (IOP): Company operates its business internationally or outside its home country; Water disclosure: Information provided by company regarding water policy and water stewardship activities toward the stakeholders; Firm size (SIZE): The size of company that is measured by total assets; Firm profitability (PRF): Company's profitability that is measured by return on asset (ROA); Leverage (LEV): The ratio of total liabilities to total assets; Firm age (AGE): Firm's age since its inception; Water disclosure index (WDI): The total score of water parameter disclosed by company in annual and/or sustainability report according to water disclosure guideline; Return on assets (ROA): The ratio of total profit/loss to total assets; Sustainable Development Goals (SDGs): An universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity (United Nations Development Programme, nd)

**Author contributions** APW helped in conceptualization, methodology, data curation, investigation, formal analysis, project administration, visualization, writing—original draft, writing—review & editing. DS contributed to conceptualization, methodology, data curation, investigation, formal analysis, visualization, writing—original draft, writing—review & editing.

**Funding** The authors declare that no funds, grants, or other supports were received during the preparation of this manuscript.

**Data availability** The dataset used in this study are available from the corresponding author on reasonable request.

## Declarations

**Conflict of interests** The authors declare no competing interests.

## References

- Alnabsha, A., Abdou, H. A., Ntim, C. G., & Elamer, A. A. (2018). Corporate boards, ownership structures and corporate disclosures: Evidence from a developing country. *Journal of Applied Accounting Research*, 19(1), 20–41.
- Alotaibi, K. O., & Hussainey, K. (2016). Determinants of CSR disclosure quantity and quality: Evidence from non-financial listed firms in Saudi Arabia. *International Journal of Disclosure and Governance*, 13, 364–393.
- Amodu, N. A. (2020). *Corporate social responsibility and law in Africa: Theories, issues and practices*. Routledge.
- Anbumozhi, V., Breiling, M., Pathmarajah, S., & Reddy, V. R. (2012). *Climate change in Asia and the Pacific: How can countries adapt?* Tokyo: Asian Development Bank Institute.
- Askham, T. (2019). Water-related disclosures by food producer companies in South Africa. *Environment Report Management Africa (Adv Environment Account Management)*, 8, 91–125.
- Bai, J., Chen, X., Yang, L., & Fang, H. (2012). Monitoring variations of inland lakes in the arid region of Central Asia. *Frontiers in Earth Science*, 6(2), 147–156.
- Bates, B., Kundzewicz, Z. W., Wu, S., & Palutikof, J. (2008). *Climate change and water*. Intergovernmental Panel on Climate Change.
- Bebbington, J., & Unerman, J. (2018). Achieving the United Nations sustainable development goals: An enabling role for accounting research. *Account Audit Account J*, 31(1), 2–24.
- Brown, N., & Deegan, C. (2012). The public disclosure of environmental performance information—a dual test of media agenda setting theory and legitimacy theory. *Accounting and Business Research*, 29(1), 21–41.
- Bryson, J. M. (2004). What to do when stakeholders matter. *Public Management Review*, 6(1), 21–53.
- Burrit, R. L., Christ, K. L., & Omori, A. (2016). Drivers of corporate water-related disclosure: Evidence from Japan. *Journal of Cleaner Production*, 129, 65–74.

- Cahaya, F. R., Porter, S., & Tower, G. (2016). Coercive media pressures on Indonesian companies' labour communication. *International of Journal Critical Accounting*, 8(2), 95–117.
- Cahaya, F. R., Porter, S., Tower, G., & Brown, A. (2017). Coercive pressures on occupational health and safety disclosures. *Journal of Accounting Emergency Economics*, 7(3), 318–336.
- Camilleri, M. A. (2017). Corporate social responsibility policy in the United States of America. In S. O. Idowu, S. Vertigans, & A. S. Burlea (Eds.), *Corporate social responsibility in times of crisis: Practices and cases from Europe* (pp. 129–143). Springer International Publisher.
- Cesar, S., & Jhony, O. (2021). Making or breaking social license to operate in the mining industry: Factors of the main drivers of social conflict. *Journal of Cleaner Production*, 278, 123640.
- Cheruiyot, T. K., & Onsando, P. (2016). Corporate social responsibility in Africa: Context, paradoxes, stakeholder orientations, contestations and reflections. In A. Stachowicz-Stanush (Ed.), *Corporate social performance in the age of irresponsibility - Cross national perspective* (pp. 89–110). Information Age Publishing.
- Ching, H. Y., & Gerab, F. (2017). Sustainability reports in Brazil through the lens of signaling, legitimacy and stakeholder theories. *Soc Responsib J*, 13(1), 95–110.
- Christ, K. L. (2014). Water management accounting and the wine supply chain: Empirical evidence from Australia. *The British Accounting Review*, 46(4), 379–396.
- Clarkson, M. B. E. (1995). A stakeholder framework for analyzing and evaluating corporate social performance. *Academy of Management Review*, 20(1), 92–117.
- Dibia, N. O., & Onwuchekwa, J. C. (2015). Determinants of environmental disclosures in Nigeria: A case study of oil and gas companies. *Int J Fin Account*, 4(3), 145–152.
- Egan, M., Frost, G., & Andreeva, Z. (2015). *Eroding corporate water reporting? CPA, Australia: A Study of The Australian food beverage and tobacco sector*.
- Elijido-Ten, E., Kloot, L., & Clarkson, P. (2010). Extending the application of stakeholder influence strategies to environmental disclosures: An exploratory study from a developing country. *Account Auditing Accounting Journal*, 23(8), 1032–1059.
- Elkington, J. (1997). *Canibals with forks: The triple bottom line of 21st century business*. United Kingdom: Capstone Oxford.
- Feng, W., Lu, H., Yao, T., Guan, Y., Xue, Y., & Yu, Q. (2022). Water environmental pressure assessment in agricultural systems in Central Asia based on an Integrated Excess Nitrogen Load Model'. *Science of the Total Environment*, 803, 149912.
- Fernandez-Feijoo, B., Romero, S., & Ruiz, S. (2014). Effect of stakeholders pressure on transparency of sustainability reports within the GRI framework. *Journal of Business Ethics*, 122, 53–63.
- Fragoso, R. M. S., & Noéme, C. J. A. (2018). Economic effects of climate change on the Mediterranean's irrigated agriculture. *Sustain Account Manag Policy J*, 9(2), 118–138.
- Gaia, S., & Jones, M. J. (2017). UK local councils reporting of biodiversity values: A stakeholder perspective. *Account Aud Account J*, 30(7), 1614–1638.
- Geall S (2019) Southeast Asia and the right to safe water. <https://www.thethirdpole.net/en/regional-cooperation/southeast-asia/>. Accessed: 13 October 2021.
- National Geographic (no date) Asia: Physical geography. Available at: <https://www.nationalgeographic.org/encyclopedia/asia/>. Accessed: 15 September 2021.
- Giltsbach, L., Schütte, P., & Franken, G. (2022). Water reporting in mining: Are corporates losing sight of stakeholder interests? *Journal of Cleaner Production*, 345, 131016.
- Gujarati D N (2004) Basic econometrics. The McGraw-Hill.
- Gunawan, J. (2015). Corporate social disclosures in Indonesia: Stakeholders' influence and motivation. *Soc Responsible Journal*, 11(3), 535–552. <https://doi.org/10.1108/SRJ-04-2014-0048>
- Guthrie, J., Petty, R., Yongvanich, K., & Ricceri, F. (2004). Using content analysis as a research method to inquire into intellectual capital reporting. *Journal of Intellectual Capital*, 5(2), 282–293.
- Habbash, M. (2016). Corporate governance and corporate social responsibility disclosure: Evidence from Saudi Arabia. *Society Responsible Journal*, 12(4), 740–754.
- Hanifa, A., & Cahaya, F. R. (2016). Ethical communication on society issues: A story from Indonesia. *Journal Global Responsible*, 7(1), 39–55.
- Hazelton, J. (2013). Accounting as a human right : The case of water information. *Accounting Auditing Accountability Journal*, 26(2), 267–311.
- Hazelton, J. (2015). Developments in corporate water accounting and accountability. *Dev Corp Gov Responsib*, 8, 27–55.
- Higgins, C., & Larrinaga, C. (2014). Sustainability reporting: Insights from institutional theory. In J. Bebbington, J. Unerman, & B. O'Dwyer (Eds.), *Sustainability Accounting and Accountability*. Routledge.
- Huafang, X., & Jianguo, Y. (2007). Ownership structure, board composition and corporate voluntary disclosure: Evidence from listed companies in China. *Manag Aud J*, 22(6), 604–619.

- Huang, W., Duan, W., & Chen, Y. (2021). Rapidly declining surface and terrestrial water resources in Central Asia driven by socio-economic and climatic changes. *Science of the Total Environment*, 784, 147193.
- Humphreys, D. (2018). In search of a new China: Mineral demand in South and Southeast Asia. *Mineral Economics*, 31, 103–112.
- Greenpeace India (2013) We will not allow Mining in Mahan': Mahan Sangharsh Samiti. <https://www.greenpeace.org/india/en/press/3100/we-will-not-allow-mining-in-mahan-mahan-sangharsh-samiti/>. Accessed: 13 October 2021.
- Greenpeace Indonesia (2016) The dirty work of Banpu: What Thai investment is doing in Indonesia. <https://www.greenpeace.org/static/planet4-indonesia-stateless/2019/02/a73c27d7-a73c27d7-the-dirty-work-of-banpu.pdf>. Accessed: 13 October 2021.
- International Institute for Applied Systems Analysis (2018) Is Asia facing a coming water crisis? [https://iiasa.ac.at/web/home/resources/publications/options/Is\\_Asia\\_facing\\_a\\_coming\\_water\\_crisis\\_.html](https://iiasa.ac.at/web/home/resources/publications/options/Is_Asia_facing_a_coming_water_crisis_.html). Accessed: 13 October 2021.
- Islam, M. A., & Deegan, C. (2011). Media pressures and corporate disclosure of social responsibility performance information: A study of two global clothing and sports retail companies. *Accounting and Business Research*, 40(2), 131–148.
- Ismaeel, M., & Zakaria, Z. (2020). Perception of preparers of sustainability reports in the Middle East. *Meditari Account Res*, 28(1), 89–116.
- Kahil, M. T., Connor, J. D., & Albiac, J. (2015). Efficient water management policies for irrigation adaptation to climate change in Southern Europe. *Ecological Economics*, 120, 226–233.
- Kamal, Y. (2021). Stakeholders expectations for CSR-related corporate governance disclosure: Evidence from a developing country. *Asian Review of Accounting*, 29(2), 97–127.
- Karthe, D., Abdullaev, I., Boldgiv, B., et al. (2017). Water in Central Asia: An integrated assessment for science-based management. *Environment and Earth Science*, 76, 690.
- Kaur, A., & Lodhia, S. (2018). Stakeholder engagement in sustainability accounting and reporting: A study of Australian local councils. *Accounting Auditing Accountability Journal*, 31(1), 338–368.
- Kimuli, J. B., Di, B., Zhang, R., et al. (2021). A multisource trend analysis of floods in Asia-Pacific 1990–2018: Implications for climate change in sustainable development goals. *International Journal Disaster Risk Reduction*, 59, 102237.
- Kumarasiri, J. (2017). Stakeholder pressure on carbon emissions: Strategies and the use of management accounting. *Australasian Journal Environment Management*, 24(4), 339–354.
- Lambooy, T. (2011). Corporate social responsibility: Sustainable water use. *Journal of Cleaner Production*, 19(8), 852–866.
- Li, D., Lin, H., & Yang, Y. (2016). Does the stakeholders – corporate social responsibility ( CSR ) relationship exist in emerging countries ? *Evidence from China. Soc Responsibility Journal*, 12(1), 147–166.
- Liesen, A., Hoepner, A. G., Patten, D. M., & Figge, F. (2015). Does stakeholder pressure influence corporate GHG emissions reporting? Empirical evidence from Europe. *Accounting Auditing Accountability Journal*, 28(7), 1047–1074.
- Lodhia, S., & Hess, N. (2014). Sustainability accounting and reporting in the mining industry : Current literature and directions for future research. *Journal of Cleaner Production*, 84, 43–50.
- Lu, Y., & Abeysekera, I. (2014). Stakeholders' power, corporate characteristics, and social and environmental disclosure: Evidence from China. *Journal of Cleaner Production*, 64, 426–436.
- Masse E (2014) European Parliament approves mandatory corporate social responsibility rules. <https://www.accessnow.org/european-parliament-approves-mandatory-corporate-social-responsibility-rule/>. Accessed: 15 May 2022.
- Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of Management Review*, 22(4), 853–886.
- Nguyen, N. (2021). A review of social license to operate in Southeast Asian mining. *Extr Ind Soc*, 8, 100841.
- Northey, S. A., Mudd, G. M., Saarivuori, E., Wessman-Jaaskelainen, H., & Haque, N. (2016). Water footprinting and mining: Where are the limitations and opportunities. *Journal of Cleaner Production*, 135, 1098–1116.
- Northey, S. A., Mudd, G. M., Werner, T. T., Haque, N., & Yellishetty, M. (2019). Sustainable water management and improved corporate reporting in mining. *Water Resour Ind*, 21, 100104.
- Nyahas, S. I., Ntayi, J. M., Kamukama, N., & Munene, J. (2018). Stakeholders influence on voluntary disclosure practices by listed companies in Nigeria: An investigation of managers' perception. *International Journal Law Management*, 60(2), 267–283.

- Oh, W. Y., Chang, Y. K., & Martynov, A. (2011). The effect of ownership structure on corporate social responsibility: Empirical evidence from Korea. *Journal of Business Ethics*, 104, 283–297.
- Ohene-Asare, K., Turkson, C., & Afful-Dadzie, A. (2017). Multinational operation, ownership and efficiency differences in the international oil industry. *Energy Economics*, 68, 303–312.
- Paiva, E. L., & Vieira, L. M. (2009). International operations and export performance: An empirical study. *Management Research News*, 32(3), 272–285.
- Potluri, R. M., Batima, Y., & Madiyar, K. (2010). Corporate social responsibility: A study of Kazakhstan corporate sector. *Society Responsibility Journal*, 6(1), 33–44.
- Prno, J., & Slocombe, D. S. (2012). Exploring the origins of “social license to operate” in the mining sector: Perspectives from governance and sustainability theories. *Research Policy*, 37, 346–357.
- Qa'dan MBA, Suwaidan MS., (2019). Board composition, ownership structure and corporate social responsibility disclosure: The case of Jordan. *Society Responsibility Journal*, 15(1), 28–46.
- Qu, W., Leung, P., & Cooper, B. (2013). A study of voluntary disclosure of listed Chinese firms - a stakeholder perspective. *Management Auditing Journal*, 28(3), 261–294.
- Rankoana, S. A. (2020). Climate change impacts on water resources in a rural community in Limpopo province, South Africa: A community-based adaptation to water insecurity. *International Journal Climate Change Strategies Management*, 12(5), 587–598.
- Rashid, A., Shams, S., Bose, S., & Khan, H. (2020). CEO power and corporate social responsibility (CSR) disclosure: Does stakeholder influence matter? *Manag Aud J*, 35(9), 1279–1312.
- Rasul, G. (2014). Food, water, and energy security in South Asia: A nexus perspective from the Hindu Kush Himalayan region. *Environmental Science & Policy*, 39, 35–48.
- Rasul, G. (2016). Managing the food, water, and energy nexus for achieving the Sustainable Development Goals in South Asia. *Environment and Behaviour*, 18, 14–25.
- Ratanajongkol, S., Davey, H., & Low, M. (2006). Corporate social reporting in Thailand: The news is all good and increasing. *Qualitative Research Accounting Management*, 3(1), 67–83.
- Reverte, C. (2009). Determinants of corporate social responsibility disclosure ratings by Spanish listed firms. *Journal of Business Ethics*, 88, 351–366.
- Roberts, R. W. (1992). Determinants of corporate social responsibility disclosure: An application of stakeholder theory. *Accounting Organisation Society*, 17(6), 595–612.
- Safe Drinking Water Foundation (no date) Mining and water pollution. <https://www.safewater.org/factsheets-1/2017/1/23/miningandwaterpollution>. Accessed: 15 May 2022.
- Salehi, M., Tarighi, H., & Rezanezhad, M. (2017). The relationship between board of directors' structure and company ownership with corporate social responsibility disclosure: Iranian angle'. *Humanomics*, 33(4), 398–418.
- Sari, T. K., Cahaya, F. R., & Joseph, C. (2021). Coercive pressures and anti-corruption reporting: The case of ASEAN countries. *Journal of Business Ethics*, 171, 495–511.
- Schornagel, J., Niele, F., Worrell, E., & Boggemann, M. (2012). Water accounting for (agro)industrial operations and its application to energy pathways. *Resource Conservation Recycling*, 61, 1–15.
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach*. Wiley.
- Sharma, B. (2013). *Contextualising CSR in Asia: Corporate social responsibility in asian economies*. Singapore: Lien Centre for Social Innovation.
- Smirnova, Y. (2012). Perceptions of corporate social responsibility in Kazakhstan. *Society Responsible Journal*, 8(3), 404–417.
- Ullah, M. S., Muttakin, M. B., & Khan, A. (2019). Corporate governance and corporate social responsibility disclosures in insurance companies. *International Journal of Accounting and Information Management*, 27(2), 284–300.
- Ullmann, A. A. (1985). Data in search of a theory: A critical examination of the relationships among social performance, social disclosure, and economic performance. *Academy of Management Review*, 10(3), 540–557.
- United States Geological Survey (no date) Mining and water quality. [https://www.usgs.gov/special-topic/water-science-school/science/mining-and-water-quality?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/special-topic/water-science-school/science/mining-and-water-quality?qt-science_center_objects=0#qt-science_center_objects). Accessed: 13 October 2021.
- United Nations (no date) Water for life decade: Asia and the Pacific. <https://www.un.org/waterforlifedecade/asia.shtml>. Accessed: 13 October 2021.
- United Nations Development Programme (no date) The SDGs in action. <https://www.undp.org/sustainable-development-goals>. Accessed: 17 December 2022.
- Wicaksono, A. P., & Setiawan, D. (2022). Water disclosure in the agriculture industry : Does stakeholder. *Journal of Cleaner Production*, 337, 130605.
- Worldometer (no date) Asia population. <https://www.worldometers.info/world-population/asia-population/>. Accessed: 13 October 2021.

- Yu, H. C. (2022). Creating environmental sustainability: Determining factors of water resources information disclosure among Chinese enterprises. *Sustainable Accounting Management Policy*, 13(2), 438–458.
- Yu, H. C., Kuo, L., & Ma, B. (2020). The drivers of corporate water disclosure in enhancing information transparency. *Sustainability*, 12, 1–14.
- Yunus, S., Eljido-Ten, E. O., & Abhayawansa, S. (2020). Impact of stakeholder pressure on the adoption of carbon management strategies: Evidence from Australia. *Sustain Account Manag Policy J*, 11(7), 1189–1212.
- Zaid, M. A. A., Wang, M., Adib, M., Sahyouni, A., & Abuhijleh, S. T. F. (2020). Boardroom nationality and gender diversity: Implications for corporate sustainability performance. *Journal of Cleaner Production*, 251, 119652.
- Zhang, L., Tang, Q., & Huang, R. H. (2021). Mind the gap: Is water disclosure a missing component of corporate social responsibility? *Brit Account Rev*, 53(1), 100940.
- Zlatanovic, S. S., Stojkovic, M., & Mitkovic, M. (2020). Current state and perspective of water management policy in terms of climate change: Case study of the Velika Morava River. *International Journal Climate Change Management*, 10(5), 796–811.

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