




# Assessing the nature of corporate environmental responsibility in Zimbabwe's gold mining sector



## Authors:

Loveness Nyikahadzoi<sup>1</sup>   
 Ronnie Lotriet<sup>1</sup>   
 Anet Smit<sup>1</sup> 

## Affiliations:

<sup>1</sup>Faculty of Economic and Management Sciences, Business School, North-West University, Potchefstroom, South Africa

## Corresponding author:

Loveness Nyikahadzoi,  
 nyikahadzoi\_loveness@gmail.com

## Dates:

Received: 05 Oct. 2021  
 Accepted: 01 July 2022  
 Published: 24 Oct. 2022

## How to cite this article:

Nyikahadzoi, L., Lotriet, R. & Smit, A., 2022, 'Assessing the nature of corporate environmental responsibility in Zimbabwe's gold mining sector', *Journal of Economic and Financial Sciences* 15(1), a712. <https://doi.org/10.4102/jef.v15i1.712>

## Copyright:

© 2022. The Authors.  
 Licensee: AOSIS. This work is licensed under the Creative Commons Attribution License.

**Orientation:** In Zimbabwe, mining is a significant economic sector but has adverse environmental impacts.

**Purpose:** This article assesses environmental responsibility practiced by gold mining companies differentiated by ownership structure and assesses the ownership system that leads in environmental, social and governance practices.

**Motivation for the study:** The adverse environmental impacts inherent in gold mining need assessments to gauge the integrity of the environmental stewardship using the structure–conduct–performance paradigm as an assessment framework.

**Design, methodology, approach:** The mode of assessment is to establish, through the structure–conduct–performance paradigm, whether these governance systems affect the companies' environmental performance, and if so, to what extent. The article uses a multiple case study design with a population of 35 large-scale gold mining companies that are members of both the Chamber of Mines of Zimbabwe and the Mine Industry Pension Fund, and 23 participated. The article uses a mixed methods approach using a questionnaire and structured interviews to collect quantitative and qualitative data, respectively. The study employed Kruskal–Wallis rank test, to rank the differences in governance structures' performances.

**Findings:** The results show that gold mining companies in Zimbabwe exercise environmental stewardship. Mining companies listed on foreign exchanges and local private limited companies exhibit more responsibility than other ownership types.

**Practical implications:** Government policy to compel soil restoration and overburden management can improve these practices.

**Contribution/originality/value of the study:** This study contributes to the burgeoning literature on corporate environmental responsibility by illuminating the possible role played by ownership structure in environmental responsibility.

**Keywords:** gold mining sector; corporate social responsibility; corporate environmental responsibility; governance structure; shareholder view; stakeholder view; societal view.

## Introduction

Increased environmental catastrophes worldwide necessitate increased environmental responsibility. In Zimbabwe, several artisanal miners lost their lives in a flooding accident at the disused Cricket and Baxter Mines (Nyamukondiwa & Chidhakwa 2019). The failure of the Brumadinho tailings dam in 2019 led to the loss of lives and people's livelihoods and damaged the environment (Lumbroso et al. 2021). Typically, human activities to exploit natural resources created enormous pressures on the Earth's natural environment (Laing et al. 2019; Mani, Gunasekaran & Delgado 2018). Gold mining specifically imposes significant environmental impacts (Ranängen & Lindman 2018). These environmental impacts include, among others, consumption of resources, generation of waste, risks of pollution and risks of industrial accidents in communities close to the mining operation, to name but a few (Carvalho 2017).

Environmental responsibility includes mining companies' voluntary efforts to integrate environmental considerations into their mining operations and activities (Helfaya & Moussa 2017). Selection and implementation of best practices require planning (Cervantes, Upadhyay & Askari-Nasab 2018). Corporate environmental responsiveness has a set of initiatives aimed to mitigate a mining company's operations from damaging or degrading the natural environment (Fashola, Ngole-Jeme & Babalola 2016; Mani et al. 2018). These corporate environmental responsibility initiatives can include changes to the company's processes and policies, such as

## Read online:



Scan this QR code with your smart phone or mobile device to read online.

reducing energy consumption and waste generation, use of sustainable resources and implementing an environmental management (EM) system (Mani et al. 2018).

Over the last decade, there has been a shift towards a broader view of corporate social responsibility to include Environmental, Social and Governance (ESG) (Gillan, Koch & Starks 2021). Best practices would be whereby companies integrate ESG concerns in their business operations that voluntarily report on them (Gillan et al. 2021). According to Mani et al. (2018), companies must prioritise environmental consciousness and the well-being of society. Other impacts of mining come through the clearing of vegetation, perturbation of land and disposal of large amounts of waste (Festin et al. 2019). However, on the positive side, mining drives economic development worldwide (Laing et al. 2019). It is very significant in Zimbabwe and remains the key driver of economic revival in Zimbabwe (Chamber of Mines 2017).

Given the importance of the gold mining sector in Zimbabwe and the environmental challenges associated with this sector, this article aims to assess the ESG practices implemented by large-scale gold mining companies. This article also determines which among the selected ownership types has the best ESG practices. The first type of ownership system is local private limited companies. The second type is companies listed on the Zimbabwe Stock Exchange, the third type is companies listed on foreign stock exchanges and the fourth type is the government-owned companies. The fifth type is multinational companies with parent companies abroad but not listed on any stock exchange.

The solution to the mode of assessment is to establish through the structure–conduct–performance paradigm, whether these ownership systems affect the companies' environmental performance and, if so, to what extent. Specifically, this article examines how different companies under different ownership systems use resources such as water, energy and raw materials and ensure environmental quality (EQ) through the mine's waste dump (WD), soil restoration practices and environmental accident (EA) prevention. This article also investigates the extent to which the mining companies maintain environmental integrity in reducing contaminants, reducing mine WD through the reclamation of land and soil restoration and preventing EAs.

## Literature review

The article uses structure–conduct–performance paradigm that assumes a causal relationship between market structure, conduct and performance (Lelissa & Kuhil 2018). So far, no research in Zimbabwe has used the structure–conduct–performance framework to investigate the ESG practices where structure refers to the ownership of the business unit.

Although the structure–conduct–performance paradigm has been criticised for ignoring discretionary conduct of managers, based on the assumption that they are passive in

fostering relationships between the industry structure, the structure–conduct–performance framework has been used successfully in this study.

The successful use of the structure–conduct–performance framework emanates from the fact that the article innovates and uses three major classifications of organisational ownership systems (shareholder, stakeholder and legitimacy) as the structures which are likely to define the nature of ESG practices. These classifications determine how the selected ownership systems handle ESG practices in the gold mining sector. The company's conduct (i.e. behaviour) is ESG practices in resource usage and mine waste management. The performance refers to how the company implements its ESG systems, whether it is shareholder, valuing shareholders only, stakeholder, considering other stakeholders or legitimacy, taking into account broader stakeholders with an international flair in its actions.

### The shareholder view

In applying the shareholder approach, shareholders are the most important participants, because they provide the means of production (O'Connell & Ward 2020). This approach emphasises the shareholder's pursuit of profit maximisation as its focal point and places socially responsible activities or initiatives within the governments' domain (Bhagat & Hubbard 2020; Teece 2019). According to Bhagat and Hubbard (2020), companies should engage in corporate social activities if a more favourable trade-off between profit and social good will result. The shareholder approach seems to imply that the more a corporation is oriented towards profit, the less likely it will be environmentally responsible, as any ESG is viewed as an expense (Adegbite et al. 2020; Rashid 2020), although Unerman, Bebbington and O'Dwyer (2018) posit that firms rarely internalise all socio-environmental costs related to production.

### Stakeholder approach

Probably in criticism of the preceding approach, Freeman (2020) advanced the stakeholder approach to corporate governance. This approach emphasises that business organisations are not only accountable to their shareholders, but they should also consider the contrasting interests of all other stakeholders that can affect or are affected by the achievement of business objectives (Chaffee 2017; Freeman 2020; Hetze 2016; Richter & Dow 2017). This implies that the stakeholders affected by the mining operation's environmental damage can demand corporates to be environmentally responsible.

### Legitimacy approach

- The societal approach to ESG suggests that because companies earn their licence to operate from society, they are likely to constructively serve society's needs (Cesar & Jhony 2020). Therefore, if serving society's needs imply environmental protection, there are very high chances that

the corporates guided by the societal philosophy will be environmentally responsible (Lindman, Ranängen & Kauppila 2020). According to Clarke and Crane (2018), the legitimacy approach to ESG pays attention to international requirements towards society. Recent environmental protection calls mean that corporates with international linkages, such as companies listed on the foreign stock exchange, are likely to be more environmentally responsible (Van Tulder & Keen 2018).

- According to Meesters et al. (2021), the concept of legitimacy should seek the approval of local stakeholders and recognise the importance of addressing global norms of social and environmental governance that include diverse values, needs and interests. Based on the structure conduct, performance paradigm and the shareholder stakeholder and legitimacy perspectives, there are predictions about the likely ESG performance by the gold mining sector in Zimbabwe.

Hemingway (2017) says that shareholders invest capital and resources, while managers are stewards of resources. The duty of the managers is to make labour transform resources into acceptable products legally. The predicted performance is thus that products produced must be sold at a profit, whereafter the profit is distributed to shareholders; socially responsible activities are the domain of governments. Therefore, the shareholder stance is predicted to have poor ESG performance. In Zimbabwe, the local private limited, government-owned and multinational companies with parent companies abroad but not listed on any stock exchange are predicted to conform to the shareholder approach. This prediction is based on the named companies because of their ownership structure. The local private limited companies, multinational companies with parent companies abroad but not listed and government-owned companies are predicted to be the shareholder structure. According to Hemingway (2017), companies with private shareholders prioritise shareholders' interests. Moreover, Dentoni, Pinkse and Lubberink (2020) posit that public businesses are less likely to understand and protect socio-ecological systems as their core mission. Authors such as Chaffee (2017) and Richter and Dow (2017) suggest that the predicted conduct of companies under the stakeholder approach is that shareholders invest capital and resources, and managers are stewards and agents of the company responsible for transforming resources through labour into acceptable products. These managers strategically involve other stakeholders. The predicted performance is to sell goods at a profit with good ESG practices. In Zimbabwe, large-scale gold mining companies predicted to conform to the stakeholder structure are those listed on the Zimbabwe Stock Exchange because of their ownership structure. Clarke and Crane (2018), in support of Van Tulder and Keen (2018), postulate that the predicted conduct of companies conforming to the legitimacy approach (like the stakeholder) strategically involves other stakeholders. They also pay attention to the global needs for global stakeholders and the environment. The predicted performance is good ESG practices.

The companies listed on the stock exchange conform to the stakeholder structure, as they have other stakeholders to consider (Matthews et al. 2019). The companies listed on the foreign stock exchanges have a legitimacy approach. They have the international community as the additional stakeholder (Clarke & Crane 2018), and as suggested by Van Tulder et al. (2016), stakeholders across sectors jointly try to address (global) sustainability issues. Therefore, it is predicted that companies listed on a foreign stock exchange are likely to be the best environmental performers.

## Research design

Chih-Pei and Chang (2017) suggest that research designs are different types of inquiry, and this article used the case study descriptive research design. As suggested by Piekkari and Welch (2018), the case study design helped to present the data on the mining industry ESG practices and provided better insights into the complex behaviours of the selected mining companies. This study also works with multiple cases, as the results of numerous cases are considered more persuasive, and the overall design is more robust (Piekkari & Welch 2018). Relying on multiple case studies helped to evaluate ESG practised by companies by recognising patterns of relationships among constructs within and across cases and their underlying (logical) arguments (Baskarada 2014; Gustafsson 2017). By comparing multiple cases, the researcher provides the literature with important influences obtained through contrasts and similarities. Additional benefits with a multiple case study approach include enabling the researchers to analyse the data within and across the different categories among government-owned, locally owned, locally listed and internationally listed mining companies. By studying multiple cases, the researchers can understand the similarities and differences between the cases and thence provide the literature with valuable influences from the differences and similarities (Gustafsson 2017).

The study used the case study design, employing multiple cases in Zimbabwe's large-scale gold mining sector. The study used a mixed methods methodology, making use of both quantitative and qualitative philosophical underpinnings. Scholars classify research paradigms into two distinct categories. The first category is the positivist or the quantitative paradigm, which uses deductive reasoning. The positivist approach is concerned with uncovering truth and presenting it empirically (Rahi 2017). The advantage of the positivist approach is that it is possible to develop numeric measures of observations of resource use (RU) and EQ and study the ESG behaviour of the gold mining companies (Greener & Martelli 2018). The second paradigm is the phenomenological or interpretivist, which is qualitative by nature and uses inductive reasoning. Greener and Martelli (2018) agree that the interpretivist paradigm assumes that knowledge and meaning are derived from acts of interpretation. This method is concerned with experiences like human judgement, perceptions and actions. Its use was advantageous because the researchers appreciate and describe social reality from the different subjective

perspectives of employees who could clarify the emergent issues in the study. The researchers acknowledge that in this study, no single approach is intrinsically better than the other, and they used a combination of the two paradigms in a mixed methods approach to improve the quality of the interpretation of the results. The mixed methods research approach included elements of both positivist and interpretivist. The research used a survey questionnaire, one of the main tools of the positivist paradigm, to produce findings that can be generalised across the gold-mining entities of Zimbabwe. The researchers also used interpretivist tools such as key informants to explain emerging trends from quantitative research. Interpretive approaches give the researcher greater scope to ask questions such as 'why' and 'how' particular trends emerge (Greener & Martelli 2018).

The study had three key research components: In-depth interviews with representatives of eight known stakeholder organisations working with the gold mining sector were selected based on direct involvement with issues about the study objectives. A population-based survey was conducted to gather data on the knowledge, attitudes and practices of the selected gold mining companies' employees. Additional in-depth interviews were held with other stakeholders and key informants, depending on the emergent issues that required further explanation. The difference between the first in-depth interviews and the additional interviews are with external stakeholders from organisations that work closely with the mining industry. Furthermore, in-depth interviews were required to seek further explanation and establish possible reasons for the emergent issues. Repeat meetings with representatives or additional key informants were identified and interviewed.

The target population was gold mines which were members of both the Chamber of Mines in Zimbabwe and the Mine Industry Pension Fund at the time of the study. Five ownership systems were selected. The first ownership system is local private limited companies, where shareholders can be between 1 and 50, as directed by the *Companies and other Business Entities Act* (Chapter 24:31). The second type is companies listed on the Zimbabwe Stock Exchange in line with the listing requirements of The Zimbabwe Stock Exchange Limited (ZSE), which is a licensed securities exchange in terms of the *Securities and Exchange Act* (24:25). The third type is companies listed on foreign stock exchanges in line with the requirements of the listing country. The fourth type is government-owned, established and managed according to the provisions of the *Zimbabwe Mining Development Corporation Act* (Chapter 21:08). The fifth type is multinational companies with parent companies abroad, not listed, but private companies registered in the home country regulations.

### Participants' inclusion and exclusion criteria

For questionnaire respondents, current mine employees (at the time of the study), whether permanently or temporarily employed, could participate.

### Exclusion criteria

- Participants were to be excluded if they indicated that they were not willing to participate or refused to sign an informed consent form.
- No persons under the age of 18 years participated in the study.

At the time of the research, 35 large-scale gold mining companies were members of both the Chamber of Mines in Zimbabwe and the Mines Industry Pension Fund. From these 35 mining companies, 23 agreed to take part, representing 66% of the target population. A response rate of 66% is acceptable, given that Hendra & Hill (2019) assert this in a study on two samples, one sample with a 36% response rate and another a 66% response rate. There were minimal or nonexistent differences in outcomes. The respondents were employees availed by the participating mining companies to complete the questionnaires and hold interviews. All employees were eligible respondents; however, only those provided by the mining companies willing to participate took part in the research. Under local private companies, six companies were willing to participate and availed 34 respondents. From companies listed in the Zimbabwe Stock Exchange, six companies took part and availed 34 respondents. Five companies listed in foreign stock exchanges participated and availed 46 respondents. Government-owned had two mining companies that participated and 30 respondents. Multinational companies not listed had participating companies 4 and 32 respondents. Employees from the 23 mining companies were the respondents to the questionnaire. The 206 respondents completed the questionnaires, and all 206 questionnaires were captured as they were administered personally and electronically using the Census Survey Processing System; however, only 176 were appropriately completed and subsequently used.

### Research strategy

While reporting on nonfinancial information has become a trend for large companies (Chen, Yu and Hu 2018), it has been challenging to convert social practices and performance into financial values and more difficult when the assessment is extended to the sphere of EM (Mansour 2017).

The structure–conduct–performance paradigm has been widely used in industrial organisation theory (Khan and Hanif 2019) and has focused on market structure and economic performance (Berry, Gaynor & Scott Morton 2019). The structure–conduct–performance framework used in this article assumes a causal relationship between conduct and structure and corporate environmental responsibility performance towards the environment. Many researchers have written on ESG performance in Zimbabwe (Makanyeza, Chitambara & Kakava 2018; Nhavira 2019). In some cases, they measure organisational performance in terms of financial performance (Makanyeza et al. 2018). However, so far none have used the structure–conduct–performance framework to investigate the nature of environmental

responsibility within the gold mining sector in Zimbabwe, where structure refers to the ownership of the business unit.

The study used both subjective measures (employees' perceptions) and objective measures (accounting data) because of the mining industry's nature, where there is a lot of security and secrecy surrounding objective accounting data. The main weaknesses of subjective measures are biases inherent in perceptions (Singh, Darwish & Potočník 2016).

The study combined the two types of measures to mitigate the weaknesses of objective and subjective measures. Qualitative information was solicited from other stakeholders, such as workers' union leaders, community leaders, nongovernmental organisations working with the different mining industry and representatives from relevant statutory bodies and other institutions that work closely with the gold mining sector. Quantitative data were collected using a questionnaire. The objective data provided in the questionnaires came from nonassured management reports and company accounting records. Computer-assisted personal interview (CAPI) was used where possible to capture and enter data during the interview and survey processes. This digital data collection technique uses CSEntry to collect data for surveys created using Census and Survey Processing System (CSPPro) on Android tablets. The software assists in maximising data processing reliability by restricting data entry errors. The data were then imported into Stata for analysis. The first round of in-depth interviews was done face to face, and the questionnaires were administered personally and mostly electronically. Once quantitative and qualitative data were collected, preliminary findings for each of the objectives were analysed and these became the basis of the follow-up interviews. Most of these follow-up interviews were done through phone calls.

### Computing subjective measures

The companies' environmental responsibility measures are composed of two broad categories, namely RU and EQ. Resource use sought the employees' perceptions of companies' efficiency in water, energy and raw material usage. Environmental quality focusing on the employees' views on practices used to reduce contaminants, WD management, EA prevention and soil restoration practices. On water usage, a Likert scale measured perceptions on whether the company makes effort to provide all water source needs, recycles water for reuse in operations, invests in technologies that use less water in operations, makes effort to provide clean water used by the community and invests in water purification of water used for consumption.

For energy use, perceptions sought were whether the company invests in technologies that use less energy for operations, adopts new ways of using renewable energy, promotes renewable energy in the form of solar power, promotes renewable energy in the form of biogas for domestic fuel and provides electricity to employees at a subsidy. The usage of raw materials sought to establish the extent to which

the companies use gold-searching technology to ensure that only good quality stone is brought to the mill, that is, whether the company has practices to reduce ore poor in gold content while rewarding rewards-rich gold deposits and use of efficient gold extraction technologies. The questions asked with respect to EQ were what the company does for reduction of the contaminants, namely whether there are concrete measurable targets to judge liquid waste and methods for monitoring waste management, including whether water from mine processes is treated before releasing it into streams, the presence of a third-party audit of tailings and using recycled water to minimise contamination. Waste dumps, for this section, mainly refer to the overburden that is removed to get to the ore. The section on waste reduction sought to establish the extent to which companies consider potential environmental impacts when dumping or whether there is a functioning waste dump management program in place and some waste recycling program; it also sought to establish whether the employees agreed that the public is a stakeholder in the company's existence, whether there is environmental integrity in the mine's agenda and if it is possible to be economically viable while being environmentally responsible. The section, soil restoration practices, sought to establish employee perceptions on management's attitudes towards restoring soil and whether the practice of soil restoration was an annual process. The section also sought to establish whether employees were aware of existence of policy guiding soil restoration on decommissioning and whether they recognise the causal link between environmental performance and financial. Environmental accidents are a present risk in mining. This section seeks to establish the extent to which companies consider potential environmental impacts when adopting new technologies, the frequency of EAs and how vigilant the company is in reducing accidents.

The questionnaire used a five-point Likert scale that ranged from strongly disagree to strongly agree: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.

A mean score with a cut-off point of 0.5 was then computed using the following formula: the formula sums up all the perceptions indicated for a particular indicator. This is done to enable ranking of the perceived performances:

$$\left[ \frac{\sum_i^n Xi}{n} \right] \quad [\text{Eqn 1}]$$

Where 'Xi' represents the responses to a given Likert statement by the respondents, and 'n' is the number of statements for each of the corporate environment responsibility indicators. This resulted in three distinct categories, namely a high level of effort (3.5–5), medium level of effort (2.6–3.4) and no effort (1–2.5). The three categories were treated as follows: no effort (1), medium level of effort (2) and high level of effort (3), and these were used to calculate the values  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\Omega$ . These subjective values of  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\Omega$  were then combined with objective measures to come up

with the CSR indices, as shown in the formulas and algorithms in Table 3 and Table 4. The Kruskal–Wallis H test, a rank-based nonparametric test, was used to determine whether there are statistically significant differences in the degree of ESG practising by different mining companies' ownership systems (Cuschieri, Grech & Calleja 2019; Dag, Dolgun, & Konar 2018).

### Objective measures of environmental responsibility

The objective measures made use of economic and accounting data. The algorithms and formulas used to calculate the mining sector's performance on EM indices were adapted from Vintró and Comanjuncosa (2010) and are presented below. The algorithms help to estimate and quantify actions that ordinarily would be difficult to measure. Water consumption (W):

$$W = 1 - \frac{\text{Water consumed over the last 12 months}}{\text{top reference value}} \quad [\text{Eqn 2}]$$

Energy consumption (E):

$$E = 1 - \frac{\text{Energy consumed over the last 12 months}}{\text{Top reference value}} \quad [\text{Eqn 3}]$$

Primary material consumed (M):

$$M = 1 - \frac{\text{Primary material used over the last 12 months}}{\text{top reference value}} \quad [\text{Eqn 4}]$$

An index for RU would be determined using the following formula: The formula combines the objective measures and subjective measures to develop a balanced evaluation of the ESG practices.

$RU = \alpha_1 W + \beta_1 E + \gamma_1 M$ , where the  $\alpha_1$ ,  $\beta_1$  and  $\gamma_1$  are values based on subjective assessments, and W, E and M are objective measures for water, energy and raw materials, respectively, obtained using the formulas as shown above. The index reflects the companies' level of corporate environmental responsibility effort towards RU efficiency. The next aspect is the EQ; below are the formulas:

Reduction in contaminants (C):

$$C = 1 - \frac{\text{contaminants released this period}}{\text{contaminant emissions from last period}} \quad [\text{Eqn 5}]$$

Reduction in WD:

$$WD = 1 - \frac{\text{tons of mine waste dumps dumped}}{\text{tons of mine waste dumped from last period}} \quad [\text{Eqn 6}]$$

Percentage of restored soil (S):

$$(S) = 1 - \frac{\text{total square of restored soil}}{\text{total square of mines – degraded soil}} \quad [\text{Eqn 7}]$$

Reduction of EAs:

$$EA = 1 - \frac{\text{No. of accidents over the last 12 months}}{\text{No. of accidents from the previous 12 months}} \quad [\text{Eqn 8}]$$

The index for EQ would be determined using the following formula:  $EQ = \alpha_2 C + \beta_2 WD + \gamma_2 S + \Omega_2 EA$ , where  $\alpha_2$ ,  $\beta_2$ ,  $\gamma_2$  and  $\Omega_2$  are calculated values based on subjective measures. The objective measures of C, WD, S and EA are reduction in contaminants effort, WD management, soil restoration and prevention of EAs, respectively. The EM index would be the sum of RU and EQ indices. This index reflects the overall ESG effort and stewardship of the environment.

### Ethical considerations

The Zimbabwe Ministry of Mines and Mineral Development approved the research through a clearance letter, which authorised the researcher to contact all government departments and quasi-government departments. An institutional review board at a large north-western public university in South Africa approved the research. The first author did all interviews and then transcribed them with the help of a research assistant sworn to confidentiality. All the respondents for both the quantitative and qualitative data collection process signed an informed consent form, kept by the first author. Respondents were informed that participation was anonymous, and results were anonymous. Respondents were informed of their right to withdraw from the research process without providing any reason. They could request that information they provided be discarded and excluded from the analysis.

## Data analysis and discussion

### Measuring internal consistency

To determine the internal consistency (the extent to which the items in a scale correlate), Cronbach's alpha coefficient was used. Cronbach's alpha coefficient demonstrates internal consistency based on average correlation. Internal consistency in measurement refers to whether all aspects of the measurement measure the same thing or concept (Sharma 2016). The five items' reliability in each of the seven environmental performance categories measures the same concept. Cronbach's alpha coefficient was calculated to measure the extent to which the items measured the same thing for each element. Sharma's (2016) rule of thumb for the Cronbach's reliability test was then used to interpret the calculated alpha test; the rules say  $\alpha > 0.9$  – excellent;  $\alpha > 0.8$  – good;  $\alpha > 0.7$  – acceptable;  $\alpha > 0.6$  – questionable;  $\alpha > 0.5$  – poor and  $< 0.5$  – unacceptable. Results of the test indicate good internal consistency in the sets of five items, each measuring water efficiency 0.854, raw material use efficiency 0.886, reduction in contaminants 0.846, reduction in WD 0.888 and soil restoration 0.824. Items measuring energy efficiency had 0.762, and those measuring EA had 0.716, showing acceptable internal consistency.

## Subjective measures of resource use

Resource use assessed how different ownership systems efficiently used water, energy and raw materials. Perceptions of the employees are shown using frequencies expressed as a percentage.

As shown in Table 1, the Pearson chi-square has a  $p$ -value of 0.0001, suggesting that there is enough evidence to suggest an association between company ownership and the perceived efficient water use. Results in Table 1 show that 82.35%, 80.43% and 66.67% of employees with companies listed on the Zimbabwe Stock Exchange companies listed on foreign exchanges and government-owned mining companies, respectively, say that their companies are efficient in their use of water. An official with Zimbabwe National Water Authority explained why there was a high percentage of employees from listed companies and government-owned mining companies who perceived their companies as efficient in water usage. He said:

'[T]he majority of these mining companies are in geographical region two where rainfall is relatively high, and water is available. Companies in regions 4 and 5 must heavily invest in borehole drilling to serve the company activities and the community. Companies listed on foreign exchange have access to capital, have invested in borehole drilling equipment and can help the mine and the community.'

An official with the EM Agency said:

'[A]ll gold mining companies exercise water recycling and reuse the water, because they have to limit the amounts they release into the tailings dams. We encourage this to minimise effects on amounts of water drawn from the water bodies.'

## Employees' perceptions of energy use

As shown in Table 1, the Pearson chi-square has a  $p$ -value of 0.0001, suggesting that there is enough evidence to suggest an association between company ownership and the perceived efficient use of energy. The employees saying there is high efficiency in energy use are as follows: companies listed on the foreign exchange at 80.43% and government owned at 70.00. Although high percentages of employees perceive their companies as efficient in energy usage, an

executive from the power utility commented on the supply side of energy. He said:

'[P]ower supply is a challenge given the water levels at Kariba and capacity at Hwange thermal power station. The national power utility company cannot supply all the power needed, and we have to exercise load-shedding.'

This forces companies such as the foreign listed companies, which are well resourced, to embark on technologies that are energy efficient. An executive with one of the companies listed on the foreign exchanges said, 'We have raised over 12 million U.S. dollars for putting up a solar power plant to mitigate against the effects of downtime due to power outages'. The alternative for grid electricity is diesel-powered generators, but these generators have high carbon emission levels harmful to the environment.

## Perceptions of employees on raw materials use

As shown in Table 1, the Pearson chi-square has a  $p$ -value of 0.0001, suggesting that there is enough evidence to suggest an association between company ownership and the perceived efficient use of clean extractive technologies. The use of better extractive technologies viewed as high by the employees is reflected as following: companies listed on the Zimbabwe Stock Exchange at 91.18% of employees and companies listed on foreign stock exchanges at 84.78%. Explaining why there are high percentages of employees from listed companies perceiving their companies as efficient in raw materials usage, one of the executives commented, saying:

'[L]isting requirements positively impact raw materials usage. However, our main challenge is all companies face shortage of foreign currency to import the raw materials needed, as the Reserve Bank of Zimbabwe allows us retention of 40%. This is not enough, because most raw materials are imported.'

## Objective measures of resource use

The companies' performance, based on objective measures, reflects what the mining companies record, based on estimates obtained from the company data. There is always a need among professionals to apply an enquiring mind (Agrawal et al. 2021) because of professional scepticism (i.e.

**TABLE 1:** Employee perceptions on efficiency in water use (W), energy usage (E) and raw material usage (M).

Ownership type	% of respondents saying																	
	High W		Medium W		Low W		High E		Medium E		Low E		High M		Medium M		Low M	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Local private limited company	13	38.24	8	23.53	13	38.24	16	47.06	8	23.53	10	29.41	17	50.00	7	20.59	10	29.41
Listed in the Zimbabwe stock exchange	28	82.35	6	17.65	0	0	22	64.71	12	35.29	0	0	31	91.18	3	8.82	0	0
Listed in foreign stock exchange	37	80.43	7	15.22	2	4.35	37	80.43	7	15.22	2	4.35	39	84.78	7	15.22	0	0
Government-owned companies	20	66.67	10	33.33	0	0	21	70.00	9	30	0	0	15	50.00	4	13.33	11	36.67
Multinationals not listed	14	43.75	5	15.63	13	40.63	20	62.50	4	12.50	8	25	19	59.38	7	21.88	6	18.75
Total	112	63.64	36	20.45	28	15.91	116	65.91	40	22.73	20	11.36	121	68.75	28	15.91	27	15.34
	Pearson $\chi^2(8) = 50.0799$ , Pr = 0.0001						Pearson $\chi^2(8) = 33.3779$ , Pr = 0.0001						Pearson $\chi^2(8) = 140.0369$ , Pr = 0.001					

W, water use; E, energy usage; M, raw material usage.

to assess accounting data while bearing in mind that material misstatements might exist) (IESBA 2019). Therefore, although the accounting information is not from published financial statements, its reliability is improved through the application of professional scepticism. In this section, the results originate from applying the RU formulas earlier. Table 2 shows the values of water, energy and raw materials computed using formulas. According to Vintró and Comanjuncosa (2010), the rule of thumb is that the higher the figure, the better the ESG practice being measured.

As shown in Table 2, the Pearson chi-square has  $p$ -values of 0.0001 that signify a statistical difference in the companies' RU performance based on measures in water use, energy use and raw materials usage. Table 2 shows that local private limited companies display more water usage efficiency with a score of 0.2244 and raw materials with a score of 0.1633. Companies listed on foreign exchange indicate a lead in energy use efficiency with a score of 0.1018. Commenting on the low efficiency levels across the industry, an executive with a mining company listed on the Zimbabwe Stock exchange said:

'[O]ur usage appears as if we are inefficient because industry-wide, we [are] operating below capacity, and there are several reasons for that. Foreign currency retention is too low at 40%; also window for usage of the retained currency is 60 days, then thereafter we are required to liquidate the currency. What this implies [is] sometimes we are not able to source the raw materials. Some payments need up to 90 days, and by then we would have liquidated. Electricity also causes a lot of disruptions, and a lot of downtime due to load-shedding. With these and many more reasons, inefficiencies in resource usage are inevitable.'

### Composite indices for resource use indices

The indices were generated by combining subjective measures and objective measures. The formula  $RU = \alpha_1 W + \beta_1 E + \gamma_1 M$  sums up the assessment. As shown in Table 2,  $p$ -values of 0.0001 and 0.0011 indicate that there is enough evidence to suggest an association between company ownership and the perceived RU. Regarding water usage, local private limited companies seem to be doing better than the rest. In contrast, companies listed on foreign exchange beat the others in energy usage and raw materials usage with indices of 1.7944 and 2.6307, respectively. The

local private companies outperformed all the other companies in RU with an index of 8.2710, followed by companies listed on the foreign exchange with an index of 7.3678. The companies listed on foreign stock exchanges have local stakeholders and global stakeholders, hence the need for better efficiency.

### Subjective measures of environmental quality

Environmental quality evaluated management of contaminants and WD reduction, soil reclamation practices and EA prevention.

As shown in Table 3, the Pearson chi-square has a  $p$ -value of 0.0000, which shows that there is enough evidence to suggest an association between company ownership and the perceived reduction in contaminant practices. The results in Table 3 show that 82.35% of the locally listed companies' employees perceive that their companies have put measures to reduce contaminants, while 81.25% of employees of multinational companies not listed perceive the same.

### Employees' perceptions of companies' waste dump practices

Waste dumps for this section mainly refer to the overburden removed to get to the ore. In Table 3, the Pearson chi-square has a  $p$ -value of 0.0002, suggesting enough evidence to suggest an association between company ownership and the perceived effort to reduce mine dumps practices. Mining companies, locally and foreign-listed, have 82.35% and 71.74%, respectively, of their employees perceive them as making high effort to reduce mine WD. One mine manager said:

'[T]o get to the ore rich in gold, we have to remove overburden; sometimes ore that is not rich in gold is still bought for processing because to get to the richer ore, the less rich ore has to be extracted. However, sometimes we dump the less rich ore but do not abandon it but reserve it for future refining when need arises.'

### Employees' perceptions of companies' soil restoration practices

As shown in Table 3, the Pearson chi-square has a  $p$ -value of 0.0000, suggesting enough evidence to suggest an association between company ownership and the perceived effort to

**TABLE 2:** Objective measures in resource use.

Ownership Structure	Water usage	Energy usage	Raw materials usage	$\alpha_1 W$	$\beta_1 E$	$\gamma_1 M$	Resource use
Local private limited	0.2244 (0.3306)	0.0760 (0.0760)	0.1633 (0.0257)	4.2494 (7.3333)	1.2464 (0.81512)	2.7753 (1.1675)	8.2710 (7.7333)
Listed in the Zimbabwe stock exchange	0.0427 (0.0712)	0.0700 (0.0268)	0.1147 (0.0386)	0.8223 (1.3298)	1.2623 (0.5003)	2.1706 (0.7641)	4.2552 (1.6631)
Listed in the foreign stock exchange	0.1464 (0.3029)	0.1018 (0.0700)	0.1250 (0.0370)	2.9426 (6.0735)	1.7944 (1.16401)	2.6307 (0.6762)	7.3678 (6.1369)
Government-owned	0.0958 (.01184)	0.0630 (0.0081)	0.1156 (0.0169)	1.8167 (0.4261)	1.1431 (0.1823)	2.4179 (0.3566)	4.6743 (0.6497)
Multinational companies not listed	0.0792 (0.0306)	0.0488 (0.0255)	0.1434 (0.0678)	1.0368 (0.2140)	0.7774 (0.3795)	1.7144 (1.3874)	4.2321 (1.3483)
Chi-square	44.7430	14.7460	41.3890	38.5780	26.8390	26.9260	18.3450
$p$ -value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0011

Figures in parenthesis = standard deviation.

W, water use; E, energy usage; M, raw material usage.



**TABLE 3: Employees' perceptions of the level of effort to reduce contaminants, reduce waste dumps, restore soil and prevent environmental accidents.**

Ownership structure	% of respondents saying												Pearson chi <sup>2</sup> (8) = 34.5248, p = 0.0000											
	High C		Medium C		Low C		High WD		Medium WD		Low WD		High S		Medium S		Low S		High EA		Medium EA		Low EA	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Local private limited company	23	67.65	0	0.00	11	32.35	23	67.65	2	5.88	9	26.47	19	55.88	8	23.53	7	20.59	16	47.06	17	50.00	1	2.94
Listed in the Zimbabwe stock exchange	28	82.35	6	17.65	0	0.00	28	82.35	6	17.65	0	0.00	25	73.53	9	26.47	0	0.00	26	76.47	8	23.53	0	0.00
Listed in foreign stock exchange	36	78.26	5	10.87	5	10.87	33	71.74	9	19.57	4	8.70	30	65.22	13	28.26	3	6.52	28	60.87	9	19.57	9	19.57
Government-owned companies	12	40.00	5	16.67	13	43.33	15	50.00	6	20.00	9	30.00	3	10.00	12	40.00	15	50.00	15	50.00	11	36.67	4	13.33
Multinationals not listed	26	81.25	1	3.13	5	15.63	19	59.38	2	6.25	11	34.38	20	62.50	9	28.13	3	9.38	20	62.50	12	37.50	0	0.00
Total	125	71.02	17	9.66	34	19.32	118	67.05	25	14.2	33	18.75	97	55.11	51	28.98	28	15.91	105	59.66	57	32.39	14	7.95

Figures in parenthesis = standard deviation.

C, contaminants; WD, waste dumps; S, soil; EA, environmental accidents.

restore soil degraded through the mines. Nearly 74% of respondents from companies listed on the Zimbabwe Stock Exchange, 65.22% from companies listed on the foreign stock exchanges, perceive that their companies make a high effort to restore any degraded soil. One employee from a government-owned company explained why there are only 10% of employees perceived high soil restoration, saying:

'[W]e only pay attention to patches facing erosion due to rain, because with mining you never know which section you will be dumping on next, so reclaiming any pieces of land would be wasting resource.'

### Employees' perceptions of the company's reduction in environmental accident practices

As shown in Table 3, the Pearson chi-square has a *p*-value of 0.0001, suggesting an association between company ownership and the perceived effort to reduce EAs. About 76% of employees from companies listed on the Zimbabwe Stock Exchange and 62.5% from multinational companies not listed perceived their companies as having a high level of effort to reduce EAs. An officer with the risk department of one of the multinational not listed companies commented on perceptions on EAs, saying:

'[A]ccidents which occur usually are caused by daring illegal artisanal miners. At one of our mines, which were on temporary care and maintenance, artisanal miners connived with the security guards and sneaked down the mineshafts and caused a blast, which claimed eight lives. But EAs have not occurred so far.'

An officer with the EM agency confirmed that EAs have not occurred recently at any of the mines in the target population.

### Objective measures of environmental quality

Table 4 shows the objective values of reducing contaminants, reducing WD, preventing EAs and soil restoration practices.

As shown in Table 4, the Pearson chi-square has a *p*-value of 0.0001, suggesting enough evidence to suggest an association between company ownership and the perceived effort to reduce contaminants and WD. There is a significant difference in companies' performance based on a reduction in contaminants and reduction in WD. If not, there is no difference in the companies' performance based on the reduction in EAs and restoration of soils. Regarding EQ management, companies listed on the foreign exchange show more responsibility in reducing contaminants and reducing WD at 0.2767 and 0.2074, respectively, compared to the other categories. An executive with companies listed on foreign exchanges explained their lead, saying:

'[O]perating in an environment where there is a lot of scrutiny on activities, we try by all means to monitor our EM. We even have subcontracted a renowned specialist in tailings management to safeguard our activities.'

At the time of the study, all companies in the research had recorded no EAs. An informant with the EM agency said:

**TABLE 4:** Objective measures of the companies' performance in fair fund administration.

Ownership type	Reduction in contaminants	Reduction in waste dumps	Reduction in environmental accidents	Percentage of restored soil	$\alpha_2C$	$\beta_2WD$	$\gamma_2S$	$\Omega_2EA$	Environmental quality
Local private limited	0.1641 (0.0599)	0.1296 (0.0602)	1 (0.0000)	1 (0.0000)	2.9810 (1.4966)	2.3832 (1.1822)	17.4706 (5.7379)	18.0882 (2.9682)	40.9230 (7.2362)
Listed in the Zimbabwe stock exchange	0.1391 (0.1292)	0.1136 (0.0226)	1 (0.0000)	1 (0.0000)	2.7586 (2.1404)	2.1857 (0.4094)	19.0294 (1.6234)	18.9705 (2.3547)	42.9423 (4.3267)
Listed in the foreign stock exchange	0.2767 (0.0971)	0.2074 (0.1043)	1 (0.0000)	1 (0.0000)	5.6362 (2.44724)	3.9197 (1.6546)	18.0435 (2.9056)	17.0652 (4.7301)	44.6547 (8.1059)
Government-owned	0.0189 (0.0971)	0.1884 (0.0961)	1 (0.0000)	1 (0.0000)	0.6351 (1.1554)	2.6447 (0.5170)	12.4333 (3.4808)	16.7666 (3.9713)	32.4698 (6.5535)
Multinational companies not listed	0.0969 (0.0633)	0.2523 (0.0496)	1 (0.0000)	1 (0.0000)	1.6554 (1.1096)	4.2073 (1.1223)	17.4063 (3.3006)	18.9686 (3.6499)	42.2378 (4.4950)
Chi-square	106.0860	61.7160	0.0000	0.0000	90.22	63.38	40.05	8.64	46.75
p-value	0.0001	0.0001	1	1	0.0001	0.0001	0.0001	0.0709	0.0001

Figures in parentheses = standard deviation.

C, contaminants; WD, waste dumps; S, soil; EA, environmental accidents.

'[V]ery few companies practice soil restoration. The reasons for lack of soil restoration were many and varied, but the key reason is soil restoration is provided for in the statutes of Zimbabwe. Section 269 of the *Mines and Minerals Act* (21:05) provides for all open surface workings to be filled in before abandonment of a mining site. It must be noted that the concern here appears to be solely that of ensuring the safety of persons or animals and does not extend to the restoration of workings in any ecological sense, especially the re-vegetation of the site to its original unspoiled state.'

Another informant who is an executive with one of the companies listed on the Zimbabwe Stock Exchange said:

'[S]uch a step to decommission is not yet feasible in Zimbabwe, where politicians stall the decommissioning in favour of handing over to local small-scale miners. When the mining company has operational expenses too high, and the ore quality is no longer good enough, the mine may decide to close down and decommission. However, this decision so far has been hampered by the presence of risk-taking artisanal small-scale miners who then invade the mine, start apportioning themselves pieces of the mine, and continue mining. In 2018, an environmental accident occurred in one such mines where there was flooding, and people were trapped underground and lost their lives.'

### Composite indices for environmental quality

The formula below sums up the environmental quality index:

$$EQ = \alpha_2C + \beta_2WD + \gamma_2S + \Omega_2EA. \quad [\text{Eqn 9}]$$

In Table 5, the p-values of 0.0001 show a statistical difference in companies' performance based on efforts to reduce contaminants and WD and improve soil restoration. Companies listed on foreign exchanges lead to a reduction in contaminants with an index of 5.63. It is noteworthy that these companies go an extra mile; multinational companies not listed lead in a reduction in WD with an index of 4.21. Companies listed on the Zimbabwe Stock Exchange have the highest effort in soil restoration with an index of 19.03. On aggregate, companies on the foreign exchange lead in EQ responsibility at 44.65. An executive with one of the companies listed on the foreign stock exchange, explaining

**TABLE 5:** The overall stewardship of the environment by the mining companies.

Ownership type	Resource use	Environmental quality	Environmental management
Local private limited company	8.2710 (7.7333)	40.9230 (7.2362)	49.1940 (12.1619)
Listed on Zimbabwe stock exchange	4.2552 (1.6631)	42.9423 (4.3267)	47.1995 (5.3197)
Listed on foreign stock exchange	7.3678 (6.1369)	44.6547 (8.1059)	52.0225 (11.0106)
Government-owned companies	4.6743 (0.6497)	32.4698 (6.5535)	37.1442 (6.9641)
Multinational companies unlisted	4.2321 (1.3483)	42.2378 (4.4950)	46.4699 (5.3760)
Chi-square	18.345	46.747	42.646
p-value	0.0011	0.0001	0.0001

Figures in parentheses = standard deviation.

the lead, reiterated that '[w]e engage a well-known tailings management company for control and monitoring of our tailings dams'. Although the objective measures of soil restoration show no statistical difference across the corporates, results in Table 5 indicate some statistical variation across ownership systems. It is possible that respondents referred to minor soil restoration processes such as gully reclamation, while objectivities measured massive soil restorations.

### Environmental management performance

The EM index is the overall assessment of the mining companies' corporate environmental responsibility where:

$$\text{Resource use (RU)} = \alpha_1W + \beta_1E + \gamma_1M;$$

$$\text{Environmental quality (EQ)} = \alpha_2C + \beta_2WD + \gamma_2S + \Omega_2EA. \quad [\text{Eqn 10}]$$

Environmental management would be the sum of RU and EQ,  $EM = RU + EQ$ .

The results in Table 5 show a significant difference in the companies' performance in terms of RU and ensuring EQ. The highest performer in EM is companies listed on the foreign stock exchange, followed by local private limited companies. The government-owned companies do trail behind overall.

## Discussions

The article set out to assess the ESG practices by large-scale gold mining companies. The article also determined which among the selected ownership types has the best ESG practices put in place by the large-scale gold mining companies. The article examined how different companies under different ownership systems use resources such as water, energy and raw materials and ensure EQ through the mine WD, soil restoration practices and EA prevention. The article also investigated the extent to which the mining companies maintain environmental integrity in how they reduce contaminants, reduce mine WD through the reclamation of land and soil restoration and prevent EAs.

The results show that gold mining companies in Zimbabwe exercise good ESG practices, given the regulatory environment. This is in tandem with Giannarakis, Andronikidis and Sariannidis (2019), who indicate that there is an association between ownership and ESG activities. The ESG practices are context specific and are linked to the regulatory environment. Simultaneously, the results show that there are differences in how the different ownership structures perform in exercising environmental stewardship. There is evidence of an effort to maintain environmental integrity by the gold mining companies, although by varying degrees of intensity, as shown by the different indices. According to Ashfaq and Rui (2019), corporate governance arrangements, such as ownership structure, can substantially safeguard stakeholder interests in ESG practices.

The literature predicted that companies listed on foreign stock exchanges would have higher performance standards. Ezhilarasi and Kabra (2017) state that companies with foreign shareholders with decision-making influence might require higher quality environmental disclosures of activities to meet foreign reporting requirements. The global community has high expectations, so the companies exercise a societal approach to their EM systems. A common perception is that large multinational companies engage in greenwashing by projecting their community developing activities as a cover-up of potential adverse environmental impacts of their actions (Laing et al. 2019). However, this article has shown that Zimbabwe's gold mining companies listed on foreign exchanges do their core business while managing EQ responsibly through enhancing RU efficiency, saving raw materials and decreasing pollution (Cai & Li 2018).

The local private limited mining companies perform well and have good corporate citizenship and are the second-highest performers. This is contrary to the literature predictions that placed them under the shareholder model, where the focus is on profit and shareholders. Regarding spending money on corporate environmental issues, Ullah, Muttakin and Khan (2019) state that companies owned and managed by owners seemed to be more concerned about reductions in their profits and tend to be less interested in the disclosure of environment-related activities. The performance of the Zimbabwe private companies has proved this to be

otherwise. Therefore, this good performance places them under the stakeholder model, where they show concern for the environment.

Companies listed on the Zimbabwe Stock Exchange, predicted to be following a stakeholder perspective, lived up to the prediction. According to Nikolova and Arsić (2017), companies with a stakeholder perspective have an increased sensitivity to their environment. Multinational companies not listed and government-owned companies are predicted to follow a shareholder approach. According to Nikolova and Arsić (2017), the companies are only instruments of wealth creation, and their social activities are a tool to achieve economic results. These two categories lived up to the prediction. The companies do their mining activities in a manner prescribed by the government. This aligns with the shareholder perspective, where they do business legally.

## Conclusion

The population scope, which was that of membership in both the Chamber of Mines of Zimbabwe and the Mine Industry Pension Fund, was restrictive. Other large-scale mining companies in Zimbabwe are not members of these two organisations. This study contributes to the burgeoning literature on corporate ESG by illuminating the possible role played by ownership structure in ESG practices. Future research focusing on the influence of the type of ownership that includes the origin of the multinational companies can be undertaken to investigate whether the parent country or country of listing has significance. Another important aspect for investigation would be to assess the effects of the board structure and managerial attitudes on ESG practices. This article is important to gold mining companies in Zimbabwe because they can begin to improve their EM, performance and indices as a sector. By ranking the mining companies, subtle competition is spurred, and the mining companies will strive to better their performance. More indicators than RU and EQ can be included for the betterment of ESG in the gold mining sector in Zimbabwe. Moreover, policies on soil restoration and reduction in dumps of overburden, which are practices reserved for decommissioning, can be revised for better stewardship of the environment.

## Acknowledgements

The authors would like to thank Antonette Bisshoff for language and technical precision editing.

## Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

## Authors' contributions

L.N. is a PhD student at the North-West University Business School Potchefstroom campus. R.A.L. is the study supervisor and A.S. is the co-supervisor.

## Ethical considerations

Ethical clearance to conduct this study was obtained from the North-West University Economics and Management Sciences Research Ethics Committee (EMS-REC) (ref. no. NWU-01367-19-A4).

## Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

## Data availability

The data that support the findings of this study are available on request from the corresponding author.

## Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

## References

- Adegbite, E., Amaeshi, K., Nakpodia, F., Ferry, L. & Yekini, K.C., 2020, 'Corporate social responsibility strategies in Nigeria: A tinged shareholder model', *Corporate Governance: The International Journal of Business in Society* 20(5), 797–820. <https://doi.org/10.2139/ssrn.3582623>
- Agrawal, P., Birt, J., Holub, M. & Van Zyl, W., 2021, 'Professional scepticism and the accounting classroom', *Accounting Education* 30(3), 213–233. <https://doi.org/10.1080/09639284.2021.1913616>
- Ashfaq, K. & Rui, Z., 2019, 'Revisiting the relationship between corporate governance and corporate social and environmental disclosure practices in Pakistan', *Social Responsibility Journal* 15(1), 90–119. <https://doi.org/10.1108/SRJ-01-2017-0001>
- Baškarada, S., 2014, 'Qualitative case study guidelines', *The Qualitative Report* 19(40), 1–25. <https://doi.org/10.46743/2160-3715/2014.1008>
- Berry, S., Gaynor, M. & Scott Morton, F., 2019, 'Do increasing markups matter? Lessons from empirical industrial organization', *Journal of Economic Perspectives* 33(3), 44–68. <https://doi.org/10.1257/jep.33.3.44>
- Bhagat, S. & Hubbard, R.G., 2020, 'Should the modern corporation maximize shareholder value? AEI Economic Perspectives', viewed 20 September 2021, from <https://www.aei.org/research-products/report/should-the-modern-corporation-maximize-shareholder-value/> or <https://doi.org/10.2139/ssrn.3548293>.
- Cai, W. & Li, G., 2018, 'The drivers of eco-innovation and its impact on performance: Evidence from China', *Journal of Cleaner Production* 176, 110–118. <https://doi.org/10.1016/j.jclepro.2017.12.109>
- Carvalho, F.P., 2017, 'Mining industry and sustainable development: Time for change', *Food and Energy Security* 6(2), 61–77. <https://doi.org/10.1002/fes3.109>
- Cervantes, E.G., Upadhyay, S. & Askari-Nasab, H., 2018, 'Improvements to production planning in oil sands mining through analysis and simulation of truck cycle times', *Mining Optimization Laboratory* 1(780), 142.
- Cesar, S. & Jhony, O., 2020, 'Corporate social responsibility supports the construction of a strong social capital in the mining context: Evidence from Peru', *Journal of Cleaner Production* 267(3), 122162. <https://doi.org/10.1016/j.jclepro.2020.122162>
- Chaffee, E.C., 2017, 'The origins of corporate social responsibility', *University of Cincinnati Law Review* 85, 353.
- Chamber of Mines, 2017, *State of the mine industry report*, viewed 28 February 2021, from <http://www.financialgazette.co.zw/wp-content/uploads/2018/10/Mining-Survey-Report-2017.pdf>.
- Chen, C.S., Yu, C.C. & Hu, J.S., 2018, 'Constructing performance measurement indicators to suggested corporate environmental responsibility framework', *Technological Forecasting and Social Change* 135(C), 33–43. <https://doi.org/10.1016/j.techfore.2017.05.033>
- Chih-Pei, H.U. & Chang, Y.Y., 2017, 'John W. Creswell, research design: Qualitative, quantitative, and mixed methods approaches', *Journal of Social and Administrative Sciences* 4(2), 205–207.
- Clarke, A. & Crane, A., 2018, 'Cross-sector partnerships for systemic change: Systematized literature review and agenda for further research', *Journal of Business Ethics* 150(2), 303–313. <https://doi.org/10.1007/s10551-018-3922-2>
- Cuschieri, S., Grech, V. & Calleja, N., 2019, 'WASP (write a scientific paper): The use of bibliographic management software', *Early Human Development* 128, 118–119. <https://doi.org/10.1016/j.earlhumdev.2018.09.012>
- Dag, O., Dolgun, A. & Konar, N.M., 2018, 'Onewaytests: An R package for one-way tests in independent groups designs', *R Journal* 10(1), 175–199. <https://doi.org/10.32614/RJ-2018-022>
- Dentoni, D., Pinkse, J. & Lubberink, R., 2020, 'Linking sustainable business models to socio-ecological resilience through cross-sector partnerships: A complex adaptive systems view', *Business & Society* 60(5), 1216–1252. <https://doi.org/10.1177/0007650320935015>
- Ezhilarasi, G. & Kabra, K.C., 2017, 'Factors influencing environmental disclosures: Evidence from India', *IUP Journal of Accounting Research & Audit Practices* 16(1), 7.
- Fashola, M., Ngole-Jeme, V. & Babalola, O., 2016, 'Heavy metal pollution from gold mines: Environmental effects and bacterial strategies for resistance', *International Journal of Environmental Research and Public Health* 13(11), 1047–1052. <https://doi.org/10.3390/ijerph13111047>
- Festin, E.S., Tigabu, M., Chileshe, M.N., Syampungani, S. & Odén, P.C., 2019, 'Progresses in restoration of post-mining landscape in Africa', *Journal of Forestry Research* 30(2), 381–396. <https://doi.org/10.1007/s11676-018-0621-x>
- Freeman, R.E., Dmytryiev, S.D. & Phillips, R.A., 2021, 'Stakeholder theory and the resource-based view of the firm', *Journal of Management* 47(7), 1757–1770.
- Giannarakis, G., Andronikidis, A. & Sariannidis, N., 2019, 'Determinants of environmental disclosure: Investigating new and conventional corporate governance characteristics', *Annals of Operations Research* 294(1), 87–105. <https://doi.org/10.1007/s10479-019-03323-x>
- Gillan, S.L., Koch, A. & Starks, L.T., 2021, 'Firms and social responsibility: A review of ESG and CSR research in corporate finance', *Journal of Corporate Finance* 66(C), 101889. <https://doi.org/10.1016/j.jcorpfin.2021.101889>
- Gustafsson, J., 2017, *Single case studies vs. multiple case studies: A comparative study*, Academy of Business, Engineering and Science Halmstad University Halmstad, Halmstad.
- Greener, S. & Martelli, J., 2018, *An introduction to business research methods*, viewed n.d., from bookboon.com.
- Helfaya, A. & Moussa, T., 2017, 'Do board's corporate social responsibility strategy and orientation influence environmental sustainability disclosure? U.K. evidence', *Business Strategy and the Environment* 26(8), 1061–1077. <https://doi.org/10.1002/bse.1960>
- Hemingway, J.M., 2017, *Shareholder wealth maximisation as a function of statutes, decisional law and organic documents*, 74, Rev. 939, viewed 12 June 2020, from <https://scholarlycommons.law.wlu.edu/wluir/vol74/iss2/14>.
- Hendra, R. & Hill, A., 2019, 'Rethinking response rates: New evidence of little relationship between survey response rates and nonresponse bias', *Evaluation Review* 43(5), 307–330. <https://doi.org/10.1177/0193841X18807719>
- Hetze, K., 2016, 'Effects on the (CSR) reputation: CSR reporting discussed in the light of signalling and stakeholder perception theories', *Corporate Reputation Review* 19(3), 281–296. <https://doi.org/10.1057/s41299-016-0002-3>
- International Ethics Standards Board for Accountancy (IESBA), 2021, *A handbook of the code of ethics for professional accountants*, viewed 20 September 2021, from [https://www.ifac.org/system/files/publications/files/IESBA-English-2021-IESBA-Handbook\\_Web.pdf](https://www.ifac.org/system/files/publications/files/IESBA-English-2021-IESBA-Handbook_Web.pdf).
- Khan, M.U.H. & Hanif, M.N., 2019, 'Empirical evaluation of "structure-conduct-performance" and "efficient-structure" paradigms in banking sector of Pakistan', *International Review of Applied Economics* 33(5), 682–696. <https://doi.org/10.1080/02692171.2018.1518411>
- Laing, T., Upadhyay, A., Mohan, S. & Subramanian, N., 2019, 'Environmental improvement initiatives in the coal mining industry: Maximisation of the triple bottom line', *Production Planning & Control* 30(5–6), 426–436. <https://doi.org/10.1080/09537287.2018.1501813>
- Lelissa, T.B. & Kuhlil, A.M., 2018, 'The structure conduct performance model and competing hypothesis – A review of literature', *Structure* 9(1), 1–17.
- Lindman, Å., Ranängen, H. & Kauppila, O., 2020, 'Guiding corporate social responsibility practice for social license to operate: A Nordic mining perspective', *The Extractive Industries and Society* 7(3), 892–907. <https://doi.org/10.1016/j.exis.2020.07.013>
- Lumbroso, D., Davison, M., Body, R. & Petkoveš, G., 2021, 'Modelling the Brumadinho tailings dam failure, the subsequent loss of life and how it could have been reduced', *Natural Hazards and Earth System Sciences* 21(1), 21–37. <https://doi.org/10.5194/nhess-21-21-2021>
- Makanyeza, C., Chitambara, T.L. & Kakava, N.Z., 2018, 'Does corporate social responsibility influence firm performance? Empirical evidence from Harare, Zimbabwe', *Journal of African Business* 19(2), 155–173. <https://doi.org/10.1080/15228916.2017.1410047>
- Mani, V., Gunasekaran, A. & Delgado, C., 2018, 'Enhancing supply chain performance through supplier social sustainability: An emerging economy perspective', *International Journal of Production Economics* 195(C), 259–272. <https://doi.org/10.1016/j.ijpe.2017.10.025>
- Mansour, A.H.A., 2017, 'How managers use the balanced scorecard to support strategy implementation and formulation processes', *Tékhnē* 15(1), 2–15. <https://doi.org/10.1016/j.tekhne.2017.04.001>
- Matthews, R.L., Tse, Y.K., O'Meara Wallis, M. & Marzec, P.E., 2019, 'A stakeholder perspective on process improvement behaviours: Delivering the triple bottom line in SMEs', *Production, Planning & Control* 30(5–6), 437–447. <https://doi.org/10.1080/09537287.2018.1501809>
- Meesters, M., Wostyn, P., Van Leeuwen, J., Behagel, J.H. & Turnhout, E., 2021, 'The social licence to operate and the legitimacy of resource extraction', *Current Opinion in Environmental Sustainability* 49, 7–11. <https://doi.org/10.1016/j.cosust.2020.11.002>

- Nhavira, J.D.G., 2019, 'The socio-economic impact of corporate social responsibility on the Zimbabwe Mining industry', in S. Mugova & P. Sachs (eds.), *Opportunities and pitfalls of corporate social responsibility*, pp. 49–71, Springer, Cham.
- Nikolova, V. & Arsić, S., 2017, 'The stakeholder approach in corporate social responsibility', *Engineering Management* 3(1), 24–35.
- Nyamukondiwa, W. & Chidhakwa, B., 2019, 'More feared dead in battlefields disaster', *The Herald*, 15 February, viewed 23 March 2022, from <https://www.herald.co.zw/more-feared-dead-in-battlefields-disaster/>.
- O'Connell, M. & Ward, A.M., 2020, 'Shareholder theory/shareholder value', in S. Idowu, R. Schmidpeter, N. Capaldi, L. Zu, M. Del Baldo & R. Abreu (eds.), *Encyclopedia of sustainable management*, pp. 1–7, Springer, Cham.
- Piekkari, R. & Welch, C., 2018, 'The case study in management research: Beyond the positivist legacy of Eisenhardt and Yin?', in C. Cassell, A. Cunliffe & G. Grandy (eds.), *The SAGE Handbook of Qualitative Business and Management Research*, Los Angeles, London, New Delhi, Singapore, Washington DC and Melbourne.
- Rahi, S., 2017, 'Research design and methods: A systematic review of research paradigms, sampling issues and instruments development', *International Journal of Economics & Management Sciences* 6(2), 1–5. <https://doi.org/10.4172/2162-6359.1000403>
- Ranängen, H. & Lindman, Å., 2018, 'Exploring corporate social responsibility practice versus stakeholder interests in Nordic mining', *Journal of Cleaner Production* 197(1), 668–677. <https://doi.org/10.1016/j.jclepro.2018.06.159>
- Rashid, A., 2020, 'Institutional shareholding and corporate social responsibility reporting: Evidence from Bangladesh', *Journal of Asia Business Studies* 15(1), 153–173. <https://doi.org/10.1108/IABS-09-2019-0285>
- Richter, U.H. & Dow, K.E., 2017, 'Stakeholder theory: A deliberative perspective', *Business Ethics: A European Review* 26(4), 428–442. <https://doi.org/10.1111/beer.12164>
- Sharma, B., 2016, 'A focus on reliability in developmental research through Cronbach's alpha among medical, dental and paramedical professionals', *Asian Pacific Journal of Health Sciences* 3(4), 271–278. <https://doi.org/10.21276/apjhs.2016.3.4.43>
- Singh, S., Darwish, T.K. & Potočnik, K., 2016, 'Measuring organisational performance: A case for subjective measures', *British Journal of Management* 27(1), 214–224. <https://doi.org/10.1111/1467-8551.12126>
- Teece, D.J., 2019, 'A capability theory of the firm: An economics and (strategic) management perspective', *New Zealand Economic Papers* 53(1), 1–43. <https://doi.org/10.1080/00779954.2017.1371208>
- Ullah, M.S., Muttakin, M.B. & Khan, A., 2019, 'Corporate governance and corporate social responsibility disclosures in insurance companies', *International Journal of Accounting & Information Management* 27(2), 284–300. <https://doi.org/10.1108/IJAIM-10-2017-0120>
- Unerman, J., Bebbington, J. & O'Dwyer, B., 2018, 'Corporate reporting and accounting for externalities', *Accounting and Business Research* 48(5), 497–522. <https://doi.org/10.1080/00014788.2018.1470155>
- Van Tulder, R. & Keen, N., 2018, 'Capturing collaborative challenges: Designing complexity-sensitive theories of change for cross-sector partnerships', *Journal of Business Ethics* 150(2), 315–332. <https://doi.org/10.1007/s10551-018-3857-7>
- Vintró, C. & Comajuncosa, J., 2010, 'Corporate social responsibility in the mining industry: Criteria and indicators', *Dyna* 77(161), 31–41.