

HOW EFFECTIVE IS REGULATION IN PREVENTING GREENWASHING? LESSONS FROM THE MINING SECTOR IN AN EMERGING MARKET

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Abstract

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The study aimed to investigate whether regulatory mechanisms are effective in curbing greenwashing. The increasing prevalence of greenwashing casts doubt and scepticism on bona fide sustainability performance. This data was collected between 2019 to 2023. The questionnaire was sent to a cross-sectional sample of 150 employees involved in regulatory issues from three divisions within South Africa's Department of Minerals and Energy (DMR). The questionnaire gathered perceptions of regulatory stakeholders about the sustainability performance (SP) and sustainability reporting (SR) practices of South Africa's Mining Companies (SAMCs). The responses were ranked on a five-point Likert scale ranging from "Strongly disagree" to "Strongly agree". Descriptive statistics, exploratory factor analysis (EFA), and structural equation modelling (SEM) were employed in the data analysis. Limited greenwashing tendencies were found in occupational health, safety and labour practices. Although there was no significant evidence of greenwashing in local enterprise development, some variables, like local housing, skills development, local infrastructure development, and environmental management activities, may require attention and enhancement. The results indicate that regulation alone has limited success in preventing greenwashing within the mining sector of South Africa. Future studies may investigate sector-specific laws and regulations to curb greenwashing.

Keywords: Greenwashing, Mining Industry, Regulation Theory, Stakeholder Theory, Structural Equation Modelling (SEM), Sustainability

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1. INTRODUCTION

According to De Jong et al. (2018) and Kolcava (2023), greenwashing is common in modern business. De Freitas Netto et al. (2020) argue that greenwashing is growing substantially while green scepticism is growing alongside it. The increasing prevalence of greenwashing also casts doubt and scepticism on bona fide sustainability policies that undermine the very essence of sustainable development (De Jong et al., 2018). Parallel to this argument are continual claims that sustainability reporting (SR) facilitates greenwashing (Wang & Sarkis, 2017; Gatti et al., 2019). Furthermore, Lukinović and Jovanović (2019) argue that stakeholders can be deceived into accepting sustainability reports as a true reflection of companies' sustainability performance (SP). Since unsubstantiated claims may not be easy to detect, stakeholders are misled to believe that such companies are responsible corporate citizens. Yao et al. (in press) found a relationship between rigorous climate policies and greenwashing behaviour. They further established climate risks, such as internal financial distress and external environmental subsidies, contributing to greenwashing. Regrettably, companies are practising greenwashing instead of performing sustainability activities to reduce the negative impacts of their business operations on society (Lukinović & Jovanović, 2019). Zhou et al. (2024) argue that environmental administrative penalties, in other words, regulation, have the opposite effect from what is expected. After being fined, companies seem more prone to greenwashing to create a positive image for their organisations.

De Freitas Netto et al. (2020) refer to seven sins of greenwashing, namely:

- 1) The sin of hidden trade-off, one or some of the company's behaviours are green;
- 2) The sin of no proof to substantiate green claims;
- 3) The sin of vagueness, poorly defined claims that are impossible to verify;
- 4) The sin of worshipping false labels, fake endorsements, and unauthorised certification icons are used for impression management;
- 5) The sin of irrelevance, green claims may be truthful but unimportant for significant improvements;
- 6) The sin of the lesser of two evils, green behaviours, merely reflect a comparison with truly bad earlier behaviours;
- 7) The sin of fibbing or lying.

Due to greenwashing's negative meaning, analysing its level and how companies use it is difficult, making it harder to find effective methods to solve the problem. However, Mesjasz-Lech (2023) argues that macroeconomic solutions, such as regulations, for example, a European Union (EU)-wide classification system for environmentally sustainable economic activities concerning environmental goals, can decrease greenwashing. Zervoudi et al. (2025) argued that greenwashing can be decreased through stronger regulatory frameworks, improved corporate accountability, increased consumer awareness, and a multi-stakeholder approach.

Considering the above, greenwashing seems broader than companies' mechanisms to miscommunicate their actual SP with no tangible evidence. The effectiveness of regulatory mechanisms in preventing greenwashing remains

a critical area of debate in sustainability and corporate governance. While studies by Sun and Zhang (2019) argue that regulation alone cannot eliminate greenwashing, emerging research suggests that regulatory effectiveness depends on aligning enforcement mechanisms with stakeholder expectations (Kolcava, 2023). This study fills an existing gap by empirically evaluating whether South African mining regulations adequately curb greenwashing tendencies. Furthermore, recent findings indicate that regulatory frameworks should integrate community feedback mechanisms to enhance their impact (Babarinde & Wright, 2024). This study contributes to policy discussions by assessing the interaction between regulatory compliance, stakeholder engagement, and corporate sustainability performance.

The rest of the paper is structured as follows. Section 2 presents a review of the literature on greenwashing and the effectiveness of regulation in reducing it. Section 3 provides the study's theoretical basis. Section 4 provides the methodology. Section 5 presents and discusses the results. Section 6 provides the conclusions and recommendations for future work.

2. LITERATURE REVIEW

Since being green carries potential benefits for companies, greenwashing has also emerged as sustainability's "evil twin" (De Jong et al., 2018). According to Testa et al. (2018), the greenwashing concept is an umbrella term that characterises superficial and misleading sustainability information. For this study, greenwashing refers to inconsistencies between a company's SP and its SR (Matakanye & van der Poll, 2021). Abernathy et al. (2017) found that manipulative companies use concealment and attribution to influence stakeholders' impressions. The main intention of companies that practice greenwashing is to reap the benefits of being green without behaving accordingly (De Freitas Netto et al., 2020; Li et al., 2025).

While companies have, in practice, embedded sustainability into the corporate ethos, some tend to resort to greenwashing practices to frame an image of a socially and environmentally responsible business, thus manipulating stakeholders' perceptions (Wang & Sarkis, 2017). Furthermore, according to Gatti et al. (2019), greenwashing has far-reaching ramifications for the company and its stakeholders at large and the environment, for example:

- Greenwashing may backfire on the company by negatively impacting its legitimacy and reputation due to increased scrutiny.
- Greenwashing can harm the company financially due to growing stakeholder scepticism about the authenticity of green claims.
- Greenwashing may result in a breach of legislative regulations when companies navigate the rules.
- Consumers may become increasingly sceptical of sustainability claims, regardless of the level of greenwashing by companies.

Gatti et al. (2019) and Muzata (2023) indicate that greenwashing harms consumers, companies, and the environment. Furthermore, Li et al. (2023) established that greenwashing positively affects corporate financial performance. However, according to De Jong et al. (2020), greenwashing does not pay;

what pays off is the company's honest and transparent communication about its sustainability behaviour. Unfortunately, society as a stakeholder may have no practical instrument to discern any links between SP and SR or the means to authenticate SP information purported in SR.

The researchers view SP and SR as two constructs that may complement each other. In line with Herbohn et al. (2014), this study disentangles SP from SR; therefore, SR is not deemed a proxy for SP. The greenwashing phenomenon may continue unabated and without punitive consequences if the SP and SR constructs are not separated. Therefore, these complementary constructs are measured separately in this study.

In agreement with Herbohn et al. (2014), the researchers are amenable to a stakeholder perspective, which may prompt progressive responsiveness to sustainability issues. This study uses responsive regulation to resolve the SP-SR gap within the context of company-stakeholder dialogues. This approach may offer mining companies and stakeholders a platform to eliminate greenwashing tendencies.

2.1. Effectiveness of regulation in reducing greenwashing

Governments are increasingly promulgating legislation as a catalyst for sustainable development, making sustainability a public policy agenda (Liu et al., 2017). Authorities should consult communities in mining entities and request input from them to foster sustainability practices and prevent greenwashing. Ngorima (2019) studied the perceptions of sustainability practitioners regarding the quality of the SR of Johannesburg Stock Exchange (JSE) listed companies after introducing mandatory requirements. According to Ngorima (2019), the mining industry performed better than other sectors in SR, as it provided more information than other sectors. Specifically, the sector performance was attributed to legislative requirements of the industry with definite industry targets for sustainable development (Ngorima, 2019; Muzata, 2023).

According to Mathibe (2011), the mining charter is a regulatory instrument with definite industry targets to effect sustainable growth and meaningful transformation of the South African mining industry. The charter requires the mining industry to comply with and report on the following elements: ownership, mineral beneficiation, procurement, supplier and enterprise development, human resources development, mining community development, employment equity, and principles for housing and living conditions standards, among others (South African Government, 2018).

Mixed results from various studies indicate that regulation alone is not the ultimate panacea for greenwashing. Even during various enforcement regimes in different countries, the relationship between SP and SR does not seem to improve at the required rate. It may, therefore, be crucial for policymakers not to rely solely on regulations. Other means ought to be investigated to improve the SP-SR relationship. In addition to the increased regulatory burden and the regulatory regime, there may not be a response. When governments introduce new regulations, they may need to consider a delicate balance to ensure desired sustainability outcomes

without compromising past and long-term sustainability goals. Government regulation, coupled with other stakeholder-centric approaches, may yield desired net benefits for business and society. Therefore, applying a pluralistic approach to promoting sustainable development is plausible.

2.2. Sustainability areas susceptible to greenwashing tendencies

A few studies, such as Wiseman (1982) and Deegan and Rankin (1996), have empirically examined both SP and SR in relation to regulation, with mixed results. In this section, prior literature on the three sustainability areas that are likely to be prone to greenwashing tendencies is examined from the context of regulation, starting with community development, followed by employee welfare and environmental protection.

2.2.1. Community development

Hossain et al. (2015) examined sustainability practices in the rapidly growing mobile telecommunications industry in Bangladesh. The results show that the focus on community and development disclosures is partly motivated by the drive to maintain legitimacy in an extremely competitive industry. Bocken et al. (2015) saw strategic investment in community development initiatives as giving back to society. Such initiatives may include industrial attachments, whereby community members are linked to industrialists for skills and relevant work-related exposure to young women and men, thereby improving their quality of life. Liao et al. (2017) established that community involvement and development received the highest priority in SR.

2.2.2. Employee welfare

According to Ranängen and Zobel (2014), sustainability gives employees a voice in the workplace. Ruiz-Frutos et al. (2019) evaluated the degree of implementation of occupation and health safety (OHS) management tools and whether there is a correlation between them and SR or other indicators that assess the social aspects of OHS. They established that many companies with a high SR do not act accordingly and show low SP values when measured against corresponding performance indicators. Additionally, SR did not correlate with other indicators that assess social aspects related to OHS. OHS results were seemingly overestimated compared to data extracted from the OHS management system (Ruiz-Frutos et al., 2019). Lambrechts et al. (2019) established that SR seemed incompatible with daily operations, leading to the obscurity of the reports.

2.2.3. Environmental protection

Studies found that the SR information contained in most environmental disclosures was incomplete and often not a representative measure of actual environmental performance (Montgomery & Lyon, 2023) and, therefore, not related to the performance of the companies. This could be confirmed by earlier studies by Deegan and Rankin (1996), whose review of the environmental reporting practices of Australian companies that were successfully

prosecuted for environmental misdemeanours revealed that specific disclosure requirements that came with Australian legislative reforms for extractive industries to disclose information about the number of restoration obligations were not reported.

Moneva and Llena (2000) analysed the environmental reporting practices of companies operating in Spain from 1992 to 1994, in the wake of a new regulatory standard. The study found that the increase in SR of companies operating in Spain was not a consequence of regulatory requirements. Hughes et al. (2001) examined environmental disclosures by United States (US) companies to determine whether environmental disclosure is a valid indicator for environmental performance and whether such disclosures differed before and after the effective date of the new regulation. They also assessed whether significant differences existed between the disclosures of companies affected by a new regulation and those not. They found that although disclosures increased following changes in disclosure regulation, little change was found, and such disclosures did not fully convey companies' actual environmental performance levels.

Liu et al. (2017) investigated the impact of regulation on voluntary climate change-related disclosures (CCDs) after a regulation stipulating the disclosure of greenhouse gas (GHG) emissions was introduced. They found that CCDs increased after enacting the first regulation and decreased once companies realised the inevitability of carbon tax regulation, which would negatively affect company cashflows. The study found a net reduction in GHG disclosures. Furthermore, Baboukardos (2017) looked at empirical evidence on the role of GHG emissions reported under mandatory reporting. The study found that companies listed on the London Stock Exchange reported more extensively on their annual GHG emissions after introducing new regulations.

Chen et al. (2018) examined how mandatory disclosures impact company performance and social externalities. They established mandatory

disclosures that resulted in a decrease in industrial wastewater and SO₂ emissions, suggesting that mandatory CSR disclosure alters company behaviour and generates positive externalities. Kaur and Lodhia (2019) found that social and environmental legislation positively influences SR. Furthermore, government regulation was identified as a key driver behind adopting stakeholder engagement policies and SR practices.

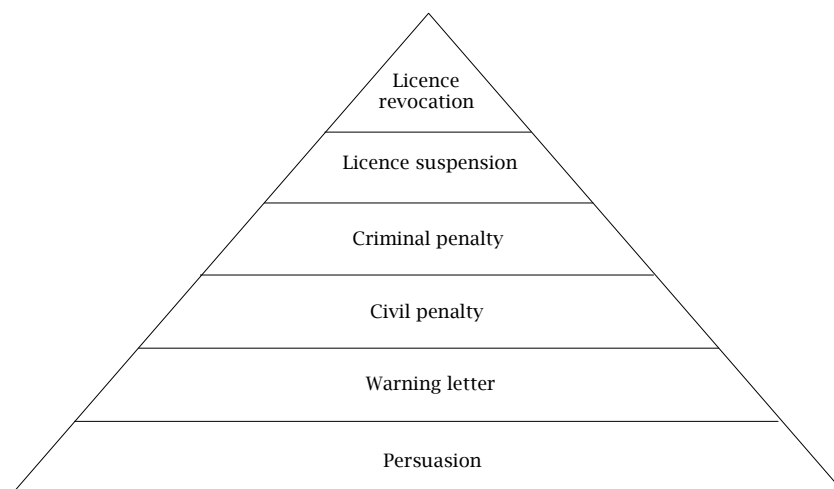
3. THEORIES OF RESPONSIVE REGULATION AND STAKEHOLDER PARTICIPATION

3.1. Responsive regulation

Responsive regulation theory originated in Braithwaite's 1985 seminal work, which examined how regulators who performed their regulatory work well achieved positive results. Rogers (1993) conceptualised this theory in terms of the enforcement pyramid, where the regulator's initial responses to proscribed behaviour take cognisance of the circumstances surrounding such activity. The enforcement pyramid is the most distinctive feature of responsive regulation theory (Rogers, 1993). First, the theory arranges different enforcement strategies in an enforcement pyramid of coerciveness, starting with less coercive solutions and moving up the hierarchy of regulatory strategies until one succeeds in fixing the problem (Braithwaite, 2016).

Responsive regulatory theory is about the idea that all these empathic attempts at engagement will often fail to secure compliance and that failure is also an opportunity to escalate to deterrence and incapacitation at the high reaches of regulatory pyramids (Braithwaite, 2011). Practically, this means that while informal procedures may be used in the first instance, regulators would not hesitate to invoke punitive legal sanctions as part of their enforcement tools, including those at the top of the regulatory pyramid. The pyramid is shown in Figure 1.

Figure 1. Roger's enforcement pyramid



Note: The space in each layer represents a proportion of enforcement activity at that level.

Source: Rogers (1993).

Figure 1 shows different enforcement strategies, from persuasion at the bottom to licence revocation at the top of the pyramid. Other mechanisms that

can be used to enforce compliance include warnings, civil penalties, criminal penalties, suspension, and licence revocation (Rogers, 1993).

According to Rogers (1993), the most restorative, dialogue-based strategies for securing compliance with a just law are at the base of the pyramid, whereas more demanding, punitive, and intrusive interventions are at the top. The enforcement pyramid assumes that non-compliance by companies is exceptional and that most regulated companies are compliant (Mascini, 2013). The regulator and the regulatee work together to achieve the required outcome (Ivec & Braithwaite, 2015). The responsive regulator ensures that the regulatee understands the pyramid's existence and that the regulator may escalate a pyramid of sanctions if regulatory concerns are dismissed (Braithwaite, 2011). Moreover, responsive regulation holds that compliance is a less painful response than persisting with resistance or disengagement (Braithwaite, 2011).

The dialogue between stakeholders is more critical at the lower rungs of the hierarchy, where suggestions are made to improve compliance. In this process, the regulator listens to the perspectives of the regulatees, which is accompanied by the regulatory response of explanation, education, giving and seeking advice, and persuasion (Ivec & Braithwaite, 2015). Although responsive regulation is focused solely on compliance, it is also performance-sensitive. According to Rogers (1993) and Osuji (2015), responsive regulation thrives where tripartism of voluntary, self-regulation, and mandatory state regulation is encouraged.

However, inspectors play a very important role in the enforcement pyramid as they are at the front lines of regulatory activity (May & Wood, 2003). Therefore, the best regulatory outcomes are achieved if inspectors respond to the actions of regulatees (Gunningham, 2017). Gormley (1998) further asserts that inspectors must exercise autonomy and considerable discretion. Implementing the enforcement pyramid is without limitations and can be difficult, especially when there appears to be no correlation between the efforts of inspectors to achieve compliance (the output) and the response of the regulators to these efforts (the outcome) (Mascini, 2013). It should be noted that although the government possesses regulatory power, it is often dependent on respective companies to provide the requisite information to effect regulation (Greenwood & van Buren, 2010).

Bolton et al. (2020) introduced a framework of stakeholder ethics as a lens to explore how regulators and regulatees adapt normative patterns of behaviour in achieving more sustainable governance and sustainability. According to Bolton et al. (2020), responsive regulation and associated stakeholder engagement constitute a significant mechanism for achieving greater sustainability, which might be achieved through regulator-regulatee partnerships. Moreover, this understanding fosters a sense of justice and purpose.

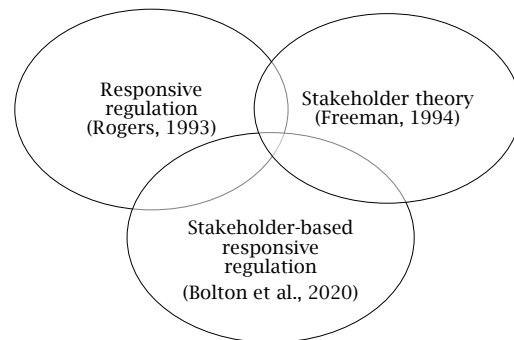
3.2. Stakeholder theory

Stakeholder theory has been used as a central paradigm for business and society (Bradford et al., 2017; Ranängen, 2017) and still dominates discussions and continues to be a key facet of the ongoing debate on sustainable development (Pérez et al., 2015). Bolton et al. (2020) used stakeholder theory to advance stakeholder-based regulation, which responds to stakeholder interests and concerns. Stakeholder theory underpins the process of responsive regulation to create

sustainable value for both the regulator and the regulatee. Responsive regulation is said to foster virtuous citizenry within a regulatory framework, often requiring regulators and regulatees to contribute meaningfully within the regulatory process (Bolton et al., 2020). Therefore, stakeholder-based responsive regulation puts the onus on both regulators and regulatees to achieve shared perceptions of risk, as well as a clear and mutual understanding of the intention of the overall regulatory framework (Bolton et al., 2020).

This study, therefore, integrates the merits of the two theories to resolve the challenge of greenwashing. Figure 2 sets the stage for integrating the theories to help in the investigation of this study, informed by its theoretical foundations.

Figure 2. Stakeholder-based responsive regulation



Source: Authors' illustration.

Figure 2 shows the evolution of stakeholder-based responsive regulation. Embedded in the responsive regulation and stakeholder theories are principles of virtuous citizenry, which often require regulators and regulatees to shift their perspectives and contributions within the regulatory process (Bolton et al., 2020). Additionally, a dialogue between companies, industries, and key stakeholders is important, as additional legislation may not be warranted (O'Faircheallaigh, 2014) to find a delicate balance when companies are held accountable for social obligations. Figure 2 shows the interconnectedness of the grounding theories for responsive regulation based on stakeholders, with stakeholder theory being the first to be developed, followed by responsive regulation theory.

4. METHODOLOGY

The study was constructed from a stakeholder and responsive regulation theories theoretical perspective. The researchers integrated the ideologies of stakeholder and responsive regulation theories with sustainability concepts to develop the compliance framework that creates links between SP and SR. The positivist philosophy guided the study to address the research objective, analysis, and interpretation of the quantitative results (Pathirage et al., 2008). Due to its ontological basis, a logical thinking process was followed to interactively link SP and SR based on responsive regulation theory and the tenets of stakeholder theory.

The unit of analysis was the South Africa's Department of Mineral Resources (DMR) employees who are directly involved in regulating the South African mining industry (SAMI). Hence, DMR employees as regulatory stakeholders were selected as respondents. The selection of regulatory

stakeholders as a unit of analysis was done previously by Gormley (1998). The researchers employed a nonprobability sampling method using a cross-sectional sample of 150 DMR employees who are involved in regulatory issues in various divisions of the Department. This research was carried out from 2019 to 2023. The research provides a perspective of DMR employees within a highly regulated mining sector post-South Africa's Mining Charter 2018.

An e-questionnaire was used to collect primary data from a cross-sample of three divisions within the DMR. The instrument comprised 154 dually structured statements to simultaneously obtain perceptions of regulatory stakeholders about the SP and SR practices of South Africa's Mining Companies (SAMCs). The items on the e-questionnaire were ranked on a five-point Likert scale ranging from "Strongly disagree" to "Strongly agree". Descriptive statistics, pairwise differences, exploratory factor analysis (EFA), and structural equation model (SEM) were employed in the data analysis. The study satisfied content, criterion-related, and construct validity. Reliability was calculated using Cronbach's alpha as Nunnally and Bernstein (1994) suggested. The study used a common heuristic for internal consistency where a Cronbach's alpha of ≥ 0.9 was considered excellent; $0.9 > \alpha \geq 0.8$ considered good; $0.8 > \alpha \geq 0.7$ considered acceptable; $0.7 > \alpha \geq 0.6$ is questionable; $0.6 > \alpha \geq 0.5$ is poor, and $0.5 > \alpha$ is unacceptable (Flo et al., 2018). The Cronbach's alpha for SP was 0.91, while the α for SR was 0.94. This was useful in understanding the general picture of the effectiveness of regulation based on the strength of the above results.

While this study provides valuable academic insights, certain limitations must be acknowledged. The reliance on self-reported perceptions from regulatory stakeholders presents the risk of response bias, as participants may provide socially desirable answers rather than objective assessments (Uyar et al., 2020). Additionally, the sample of 150 respondents from DMR may not fully capture diverse perspectives across different mining regions. Future research could mitigate these limitations by incorporating third-party audit data or using mixed methods that combine qualitative stakeholder interviews with quantitative compliance assessments. Moreover, extending the study across multiple emerging markets would enhance the generalizability of findings (Li et al., 2025).

Alternative research methodologies could have provided additional insights into greenwashing tendencies in the mining sector. A longitudinal study tracking regulatory compliance over time would allow for analysing trends rather than cross-sectional snapshots (Ranängen & Zobel, 2014). Additionally, experimental designs where mining companies are subjected to different regulatory enforcement models could yield deeper insights into the causal relationship between regulation and greenwashing (Testa et al., 2018). A comparative case study approach examining regulatory effectiveness in different mining jurisdictions (e.g., South Africa vs. Australia) would also provide useful context on best practices (Bolton et al., 2020). The use of cross-sectional data over the other approaches, like the longitudinal approach, was based on the cost and availability of data in an environment where secondary data is unavailable. Furthermore, the use of experimental designs is both costly and time-consuming.

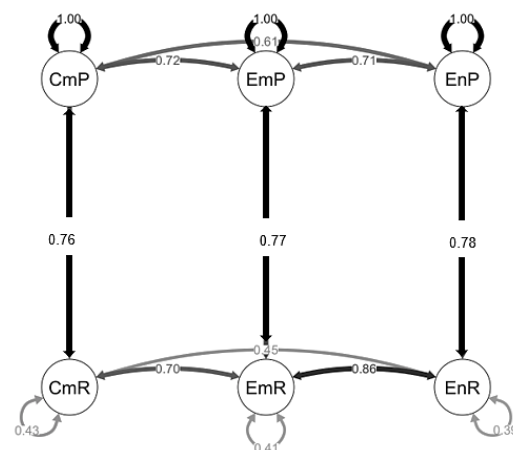
5. RESULTS AND DISCUSSION

The descriptive statistics revealed that most of the data was skewed to the left, and the right tail was longer, meaning that the distributions of the difference gap between SP and SR were positively skewed. Where the data were not normally distributed, the Wilcoxon Signed rank was used, a nonparametric test. The results of the EFA showed that the validated sustainability factors that emerged from an EFA are local enterprise development, local housing development, skills development, local infrastructure development, occupational health and safety, labour practices, diversity and inclusion, employment equity, environmental management, environmental leadership, and environmental responsibility (Matakanye & van der Poll, 2021).

The matched pairs differences test was used to determine the significance of the statistical differences in the SP and SR means. The significance of the gap between the mean scores is reflected in p-values less than 0.05, signalling greenwashing, while the lack of significance of the gap is reflected in a p-value greater than 0.05, implying no greenwashing (Matakanye & van der Poll, 2021). Greenwashing tendencies were found in OHS, labour practices, diversity and inclusion, employment equity, environmental management, and environmental leadership. Greenwashing was not detected in local enterprise development, local infrastructure development, skills development, housing and living conditions, and environmental responsibility.

The researchers further used SEM to analyse the relationship between SP and SR variables. A robust estimation technique of the SEM was employed to elucidate the relationship between SP and SR by looking at the three sustainability areas: community development, employee welfare, and environmental protection. Further details of the full model, which drills down to each sustainability indicator, can be obtained from Matakanye and van der Poll (2021). Figure 3 shows the SEM.

Figure 3. The structural equation model (SEM)



Note: CmP = SP-Community development; CmR = SR-Community development; EmP = SP-Employee welfare; EmR = SR-Employee welfare; EnP = SP-Environmental protection; EnR = SR-Environmental protection.

Source: Authors' illustration.

The model fit statistics applied for the full model show a p-value = 0.006, CFI = 0.975, TLI = 0.968, RMSEA = 0.046, and SRMR = 0.086. The comparative fit index (CFI) and the non-normed

fit index (NNFI) exceeded 0. The parameter estimates for the model were carefully interpreted, and the SEM model fitted the data well, leading to the development of a compliance framework. Figure 3 shows the framework for linking SP with SR.

The study empirically measured the effect size of the differences between SP and SR. Cohen's D was computed to derive the practical application or usefulness of the results. Table 1 shows the effect size of the differences between SP and SR.

Table 1 shows that the effect size for variables like local enterprise development, environmental leadership, local employment, living conditions, and environmental responsibility was small. It is important to note that the effect of the variables under analysis is either small or medium, and none of the variables had a large effect. However, the data suggest that there may be no significant evidence of greenwashing; the small size effect may still be significant, given the potential damage of greenwashing to the environment and society.

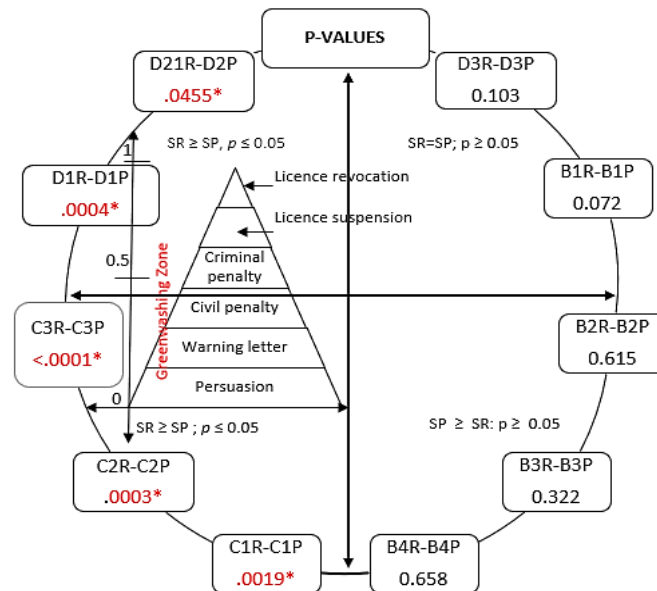
Table 1. Effect size per key performance indicator

Sub-category	Cohen's D
Local enterprise development	0.15
Infrastructure development	0.24
Local employment	0.08
Housing and living conditions	0.04
Occupational health & safety	0.26
Labour practices, diversity & inclusion	0.30
Employment equity	0.40
Environmental management	0.30
Environmental leadership	0.16
Environmental responsibility	0.13

Source: Authors' elaboration.

In Figure 4, the researchers show how the Rogers (1993) enforcement pyramid can be operationalised in the context of sustainability and its evil twin, greenwashing.

Figure 4. Curbing greenwashing through stakeholder-based responsive regulation



Note: B1R-B1P = Local enterprise development; B2R-B2P = Local infrastructure development; B3R-B3P = Skills development; B4R-B4P = Housing and living conditions; C1R-C1P OHS; C2R-C2P = Labor practices, diversity, and inclusion, C3R-C3P = Employment equity; D1R-D1P = Environmental management; D2R-D2P = Environmental leadership; D3R-D3P = Environmental responsibility.

Source: Adapted from Rogers (1993).

Figure 4 shows that of the 10 identified factors, five on the left-hand side (OHS, labour practices, diversity and inclusion, employment equity, environmental management, and environmental leadership) are in a greenwashing zone due to statistical significance. This indicates that intervention by regulators and regulatees is required, as greenwashing tendencies were prevalent within SAMI. Therefore, the study proposes responsive regulation of greenwashing using the Rogers (1993) enforcement pyramid. However, five factors on the right-hand side (local enterprise development, local infrastructure development, skills development, housing and living conditions, and environmental responsibility) do not signal greenwashing.

5.1. Local community development

The study failed to conclude that there is evidence of greenwashing in the local community development factor. This is consistent with Liao

et al. (2017) and Hossain et al. (2015), who indicated that community involvement and development received the highest priority in SR. Companies must commit and contribute to the local economy and maintain good relations with the community (Costa & Menichini, 2013). According to Marais and de Lange (2021), local community development is highly weighted in the 2018 Mining Charter compliance scorecard. Hence, the mining industry plays an important role in promoting local enterprise development. Although the charter is viewed as a policy and not a law, it seems as though mining companies do adhere to the policy.

5.2. Local infrastructure development

The research concluded that there is no greenwashing by SAMCs in this indicator, thereby supporting the results of Dissanayake et al. (2016), who found that companies feel some stakeholder pressure from the government when there is a policy

focus on infrastructure development for legitimacy purposes. This is an important outcome for social partners (stakeholders) in developing local infrastructure, as it increases their trust and cements their legitimacy and licence to operate in host communities.

5.3. Skills development

The study failed to conclude that there could be evidence of greenwashing in the skills development factor. The results resonate with Duff (2017) argued that companies incorporate skills development within sustainability strategies by extending internal skills development initiatives to communities where they operate to maintain legitimacy. Moreover, companies have a wider interest in training and development, appealing to youth and graduates to create an image of integrity. Bocken et al. (2015) established that strategic investments in community development initiatives are viewed as giving back to society. Greenwashing in this area should be avoided as it may potentially create conflict or tension between host communities and SAMC (Liao et al., 2017). Improving the skill profile of members of the host community is required to enable them to participate in the mining value chain and other external opportunities. Companies in South Africa pay a Skills Development Levy (SDL) determined by the salary bill of the company (South African Revenue Services [SARS], n.d.). This is an example of when legislation is successfully incorporated for the development and the community. Compliance is regularly monitored, and defaulters are made to pay with penalties. In such or similar instances, greenwashing on participation in skills development programmes might be deterred.

5.4. Housing and living conditions

The study found no noticeable levels of greenwashing when reporting on housing and living conditions. Therefore, regulators and regulatees may find it easier to move as social partners to tackle the negative externalities and real issues creating the negative perceptions associated with mining companies in sensitive areas such as housing and social infrastructure. The absence of greenwashing in this factor is a significant result consistent with Ngorima (2019), who attributed successes to the 2018 Mining Charter and Social and Labour Plans Guideline 2010 (SLP) (DMR, 2010). These results also confirm that the participation of companies in the community can positively impact the welfare and living standards of the community (Liao et al., 2017).

5.5. Occupational health and safety

The researchers concluded that there are greenwashing practices in the OHS factor. The results are supported by evidence from Ruiz-Frutos et al. (2019), who found that SR did not correlate with other indicators assessing social aspects of OHS. OHS results were seemingly overestimated compared to data extracted from the OHS management system (Ruiz-Frutos et al., 2019). However, Lambrechts et al. (2019) established that SR seemed incompatible with daily operations, leading to the obscurity of the reports. Coulson (2018) argued that since the promulgation

of the Mine Health and Safety Act (MHSA), Act 29 of 1996, the mining industry in South Africa has improved occupational health and safety performance substantially. This can be ascribed to intensified regulation and improved occupational health and safety standards. However, the transition to the MHSA has not seen investment in the occupational health and safety capacity of labour to meet the MHSA statutory commitments (Coulson, 2018). This might be why greenwashing practices are still ongoing.

5.6. Labour practices, diversity, and inclusion

It can be concluded that there are greenwashing practices by SAMCs in labour practices, diversity, and inclusion factors. The results agree with those of Medrado and Jackson (2015), who indicated that companies might not want to disclose these factors, as it might lead to losing a competitive advantage. However, this contradicts Frias-Aceituno et al. (2013), arguing that Boards of directors with more experience and diversity of backgrounds can positively promote the integration of their company reports, whether mandatory or voluntary. The results also show that SAMCs have not been able to adequately respond to growing stakeholder pressure to disclose their employment practices in response to legislative and policy initiatives, as suggested by Bradford et al. (2017). The effect of regulation in addressing greenwashing tendencies in this factor seems to be limited; however, SAMCs need to play a significant role in addressing the perceived SP-SR inconsistencies found in this area through stakeholder engagement, as well as partnership and collaboration with the government (Ranängen & Zobel, 2014).

5.7. Employment equity

The study indicates greenwashing in the employment equity factor. The results are aligned with Frias-Aceituno et al. (2013), Hossain et al. (2015), and Medrado and Jackson (2015) established that half of the companies that they sampled reported employment opportunities for ethnic minorities, wherein 50% for military veterans, and 28.6% for people with disabilities. One company disclosed new employees from ethnic minority groups as a percentage. It can be concluded that the effect of regulation appears to be small, resulting in greenwashing practices on employment equity by SAMCs. Failure to respond to stakeholders' pressures can be tantamount to losing legitimacy. Additionally, a company's inability to respond to these pressures can affect the validity of its social contract, which in turn can lead to exorbitant penalties and regulatory fines. These penalties and fines are meant to ensure future compliance with employment equity guidelines.

5.8. Environmental management

The research concluded that there is evidence of greenwashing in environmental management. The results do not support Chen et al. (2018), as regulation appears ineffective in curbing the diffusion of greenwashing tendencies in this factor.

5.9. Environmental leadership

The research concluded that there is greenwashing in the environmental leadership factor. The results confirm the available literature (Wiseman, 1982; Hughes et al., 2001). Regulation appears effective, as evidenced by the absence of greenwashing in environmental leadership. Therefore, this research adds to the existing body of knowledge.

5.10. Environmental responsibility

The researchers conclude that there are no greenwashing practices in this factor. The available literature corroborates the results. Chen et al. (2018) argued that companies can alter their behaviour, and positive externalities are generated when mandatory CSR disclosure is expected. Kaur and Lodhia (2019) found that social and environmental legislation positively influences SR, and government regulation is key to adopting stakeholder engagement policies and SR practices. Regulation appears to be effective in combating greenwashing under environmental responsibility. It is also evident from the above conclusions that Hahn and Kühnen (2013) were correct about underexposed themes around regulation to highlight gaps in sustainability practices. By uncovering the 10 sustainability factors, this study identifies the missing link between SP and SR using stakeholder-based responsive regulation.

The results confirm that while regulations play a role in curbing greenwashing, inconsistent enforcement and corporate resistance often undermine their effectiveness. This aligns with previous research indicating that firms strategically comply with SR standards without fully integrating them into operational practices (Montgomery & Lyon, 2023). The persistence of greenwashing in areas such as labour practices and environmental management suggests that regulatory oversight mechanisms lack the necessary rigour or deterrent penalties (Liu et al., 2017). One contributing factor is the fragmented nature of enforcement, where some regulatory agencies prioritise compliance checklists over substantive environmental or social impact assessments (Gunningham, 2017). Addressing these gaps requires more integrated regulatory approaches that blend legal enforcement with market-based incentives and stakeholder accountability.

6. CONCLUSION

The study failed to conclude that there is evidence of greenwashing in local enterprise development, local infrastructure development, skills development, housing and living conditions, and environmental management. Greenwashing was detected under OHS, employment equity, environmental leadership, environmental responsibility, labour practices, diversity, and inclusion. Based on these results, it is concluded that regulation is a useful mechanism to curb greenwashing. However, it should be noted that regulation has limited success in preventing greenwashing. This is in line with Sun and Zhang (2019), who conceded that legislation's inhibitory effect on the sustainability practices of both dominant and smaller companies is insufficient to curb greenwashing. Therefore, it requires ethical and responsible business leadership and innovation by both businesses and regulators to resolve some of the sustainability issues. South Africa's mining sector must drift towards more inclusive stakeholder co-regulation models, wherein mining companies should engage in structured dialogues with local communities and labour unions to co-design sustainability initiatives, reducing the risk of deceptive reporting (O'Faircheallaigh, 2015). However, it may be concluded that effective regulation reduces the gap between SP and SR. If government regulations are not followed, the licence to operate can be revoked, and SAMCs can face mine closures to their detriment or fines and legal action. Therefore, it is in the interest of SAMCs to bridge the gaps between SP and SR.

This research contributes to the ongoing debate on regulatory effectiveness in mitigating greenwashing, particularly within resource-intensive industries. It highlights the critical role of compliance monitoring mechanisms and suggests regulatory adjustments that could yield better sustainability outcomes. However, given the cross-sectional nature of this study, future research should explore longitudinal data to assess whether regulatory changes yield sustained improvements in corporate sustainability behaviour (Matakanye & van der Poll, 2021). Additionally, comparative analyses across different regulatory environments could provide insights into best practices for curbing greenwashing in emerging markets.

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