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Determinant Analysis of Environmental Performance in Manufacturing Sector

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Abstract:

Environmental performance is a critical factor in mitigating adverse ecological impacts, such as pollution and waste generation, while simultaneously enhancing overall organizational efficacy. It encompasses the positive outcomes resulting from an organization's efforts to integrate environmental considerations into its operational framework. This systematic literature review aims to elucidate the organizational factors that serve as determinants of environmental performance. The study utilized the Scopus database, a reputable repository of scholarly articles and online publications, to systematically identify and filter relevant literature based on predefined criteria, resulting in a final sample of 40 articles. The search process employed the key term "environmental performance." Analysis of the selected literature reveals that determinants of environmental performance can be categorized at two distinct levels: individual and organizational. At the individual level, factors include green innovation, pro-environmental behavior, green transformational leadership, and employee engagement. Organizational-level determinants comprise green human resource management (GHRM), stakeholder and competitor pressure, buyer-supplier relationships, green intellectual capital, environmental strategy, green supply chain management, corporate social responsibility, and environmental commitment. The findings of this research provide valuable insights for executive management and practitioners, highlighting key areas of focus for the achievement of enhanced environmental performance.

***Keywords**: Environmental Performance, Manufacturing, Determinants, Sustainability, PRISMA*

Introduction

Environmental concerns have exhibited an increasing trend annually, garnering significant international attention (Jianping et al., 2014). The manufacturing sector has been identified as a primary contributor to various forms of environmental degradation, including air and water pollution, waste generation, climate change acceleration, and natural resource depletion (Syafique et al., 2020). Within the industrial sphere, particularly in manufacturing, there exists a predominant focus on profit maximization, often at the expense of optimal environmental management practices. This has resulted in suboptimal environmental performance and limited corporate engagement in conservation efforts. However, for organizations aiming to ensure sustainable growth in company value, a multidimensional approach encompassing financial, social, and environmental factors is imperative. A crucial aspect of social performance, reflective of corporate social responsibility, is the organization's environmental performance.

Molina-Azorin et al. (2009) posited that organizations are increasingly expected to incorporate environmental responsibility into their business operations. In response, governmental bodies have implemented regulatory measures, such as Article 74 of Law Number 40 of 2007 in Indonesia, which mandates socially and

environmentally responsible practices for Limited Liability Companies operating in the natural resources sector. These binding regulations are intended to elicit tangible corporate actions demonstrating compliance with governmental policies, ideally manifesting in the integration of environmental preservation into organizational objectives. The attainment of organizational goals or vision pertaining to environmental sustainability, collectively termed environmental performance, necessitates the alignment and support of all organizational elements, from strategic planning to operational execution. In light of this context, a pertinent research question emerges: What are the key factors facilitating the achievement of superior environmental performance within organizations?.

Literature Review

Environmental performance is a critical factor in mitigating adverse environmental impacts, such as pollution and waste generation, while concurrently maintaining overall organizational efficacy (Kim et al., 2019). The International Organization for Standardization (ISO) 14001 defines environmental performance as the measurable outcomes of an organization's management of its environmental aspects. This encompasses the activities, processes, products, services, systems, and organizational structures that can be effectively managed and controlled to achieve environmental objectives. Suratno, Darsono, and Mutmainah (2006) conceptualize environmental performance as an organization's capacity to foster an ecologically benign, or "green," environment. Ikhsan (2009) further elucidates that environmental performance can be quantified based on the alignment between environmental policies, targets, and objectives. Putri, Sari, and Sari (2013) posit that environmental performance is manifested through a company's efforts to create a sustainable environment by utilizing environmentally innocuous materials in its operations.

Organizations that successfully implement waste reduction strategies and promote water conservation practices among employees can positively influence their environmental performance (Paille et al., 2013). Moreover, leadership that provides environmental inspiration and mobilizes subordinates towards environmental stewardship, coupled with organizational members who possess a genuine environmental ethos, can significantly facilitate the realization of superior environmental performance. The primary objective of this research is to elucidate the factors that contribute to the achievement of environmental performance within organizations. It is anticipated that the findings from this literature review will serve as a foundational basis for future empirical investigations into the determinants of environmental performance. Additionally, these insights may provide practical guidance for stakeholders seeking to enhance environmental performance within their respective organizations.

Research Method

The Systematic Literature Review (SLR) method was used in this research with the aim of identifying, reviewing and evaluating related and relevant research in order to answer the questions that have been set in a research (Triandini et al., 2019). This research consists of several stages, namely the article selection method, inclusion criteria, and objective analysis methods. The article selection process in this research utilized the Preferred Reporting Items for Systematic Review (PRISMA) article selection stages or the PRISMA flow diagram. Articles were obtained from Scopus by searching using the keyword "Environmental Performance" and a total of 23,175 articles were obtained and then filtered on the year of publication between 2018 and 2023 to obtain 8,163 articles. Then 32 articles were selected that were accessible and relevant to the research according to the following Prisma chart:

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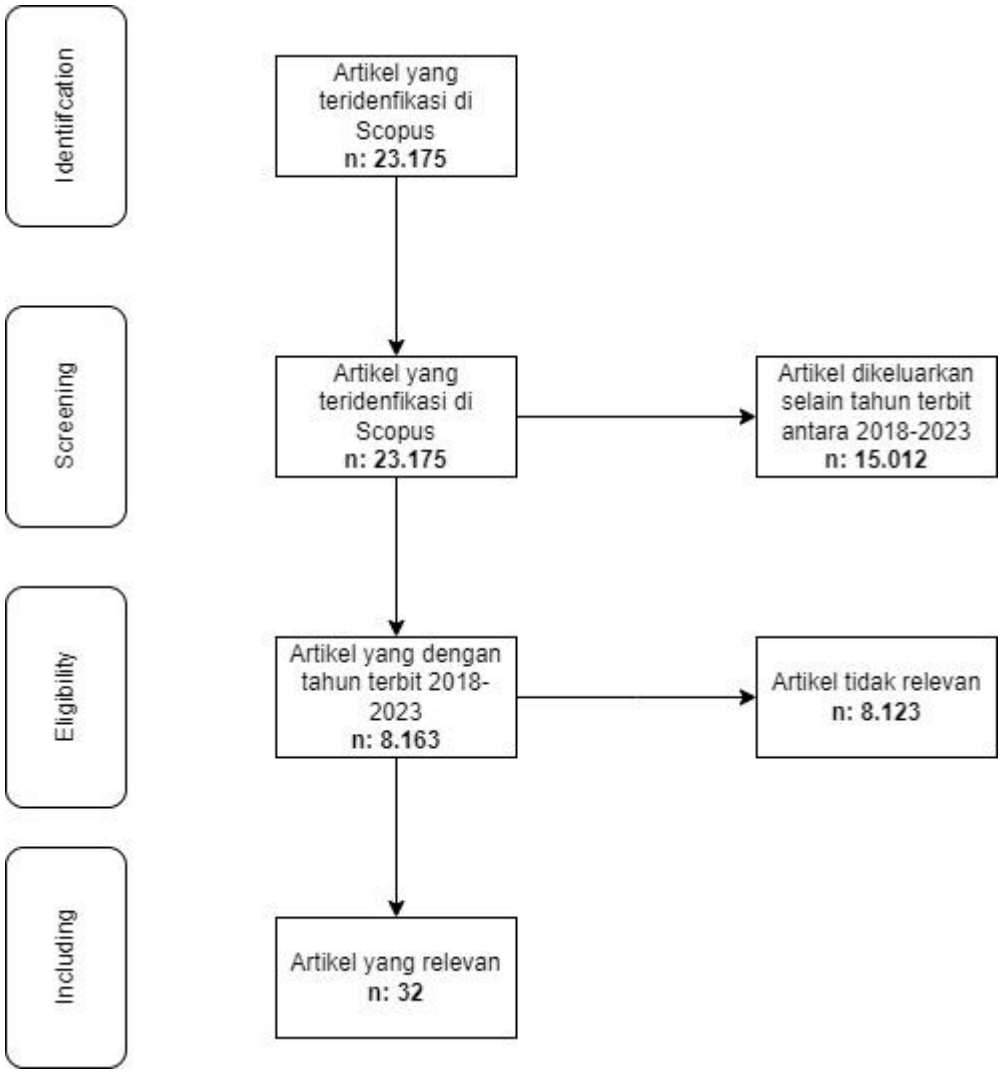

Figure 1. Prism Filtering Method

The methodological approach employed in this study comprises several sequential stages. The initial identification phase involved a comprehensive search of Scopus-indexed articles using the keyword "environmental performance," yielding a preliminary corpus of 23,175 articles. Subsequently, a temporal filter was applied to restrict the publication timeframe to the most recent quinquennium (2018-2023), resulting in a refined dataset of 8,163 articles. The rationale for this temporal demarcation is rooted in the global consensus on climate change impacts, as articulated in the Sustainable Development Goals (SDGs) established in 2018. This pivotal global agreement serves as the foundation for the author's analytical focus on climate change research from 2018 onwards. Furthermore, this timeframe coincides with an increased emphasis on governmental policies mandating industrial and business accountability for climate change impacts and environmental sustainability.

The eligibility phase further refined the article selection based on the following criteria, aligned with the research objectives: open access availability, thematic focus on business management, psychology, and human resources, English language publications, journal quality metrics (Q1 and Q2 quartile rankings), and citation frequency (descending order). The application of these rigorous selection criteria resulted in a final corpus of 32 articles that directly address the research objectives. This methodical approach ensures a comprehensive yet focused review of the most relevant and impactful literature within the specified domain.

Results and Discussion

At this stage, data is collected on the articles above into table form. Next, an in-depth review and study of the article was carried out by focusing on the research results and the highest number of article citations. At the end of the research, a comparison of the findings from several articles was carried out and conclusions were drawn regarding the supporting variables for environmental performance.

Table 1. Table of Research Content Regarding Determinants of Environmental Performance

No.	Year	Writer	Title	Journal	Publisher	Amount Citation	Determinants of Environmental Performance
1.	2020	Sanjay Kumar Singh,Manlio Del Giudice,Roberto Chierici,Domenico Graziano	Green innovation and environmental performance: The role of green transformational leadership and green human resource management	*Technological Forecasting and Social Change*	Elsevier	741	Green Transformational Leadership through HRM and HRM through Green Innovation influence Environmental Performance
2.	2020	Sascha Kraus, Ur Syafique Rehman, F. Xavier Sendra Garcia	Corporate social responsibility and environmental performance: The mediating role of environmental strategy and green innovation	*Technological Forecasting and Social Change*	Elsevier	401	Corporate Environmental Performance through Environmental Strategy and Green Innovation influences Environmental Performance
3.	2020	Sascha Kraus, Ur Syafique Rehman, Dmitry Khanin, Raj V Mahto, Syeg Asim Syah	Analyzing the relationship between green innovation and environmental performance in large manufacturing firms	*Technological Forecasting and Social Change*	Elsevier	253	Green Intellectual Capital, Green Human Resource Management, through Green

							Innovation and Environmental Strategy moderation influence Environmental Performance
4.	2021	Ahmed Abdel-Maksoud , Mirna Jabbour & Magdy Abdel-Kader	Stakeholder pressure, eco-control systems, and firms' performance: empirical evidence from UK manufacturers	Accounting Forum	Wiley	55	Stakeholder pressure and eco-control systems can influence firm performance (economic & environmental performance)
5.	2022	Junaid Aftab, Nabila Abid, Nicola Cucari, Marco Savastano	Green human resource management and environmental performance: The role of green innovation and environmental strategy in a developing country	Business Strategy & Environment	Wiley	48	Green innovation, environmental strategy and pro-environmental behavior influence environmental performance through operational efficiency, environmental strategy and environmental passion.

6.	2020	AM Ghouri, VMani, V., MR,Khan, N.R,Srivastava, AP	Enhancing business performance through green human resource management practices: an empirical evidence from Malaysian manufacturing industry	International Journal of Productivity and Performance Management	Emerald	38	GHRM affects EP
7.	2021	Manjot Singh Bhatia, Saurabh Kumar	Linking stakeholders and competitive pressure to Industry 4.0 and performance: Mediating effect of environmental commitment and green process innovation	Business Strategy and the Environment	Wiley	35	Stakeholder & competitor pressure, environmental commitment, green process innovation are supporting factors for firm performance (economy & environmental performance)
8.	2023	Ye, F.,Huang, G.,Zhan, Y.,Li, Y.	Factors Mediating and Moderating the Relationships Between Green Practice and Environmental Performance: Buyer-Supplier Relations and Institutional Context	IEEE Transactions on Engineering Management	IEEE	7	Internal and external green practices and buyer–supplier relations are supporting factors for environmental performance

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9.	2023	Stephanie Graham, Trevor Cadden, Raymond Treacy	Examining the influence of employee engagement in supporting the implementation of green supply chain management practices: A green human resource management perspective	Journal of BusinessStrategy and Environment	Wiley	4	Green supply chain management and employee engagement are supporting factors for environmental performance
10.	2022	MahiUddin	Leveraging Green Human Resource Management Practices Towards Environmental Performance: An Empirical Evidence From The Manufacturing Context In Emerging Economy	*International Journal of Business and Society*	Unimas	2	Green job analysis and job description, green training and development, and green rewards and compensation (GHRM) significantly affects environmental performance.

Determinants of environmental performance can be grouped into two, namely individual level and organizational level according to the following chart:

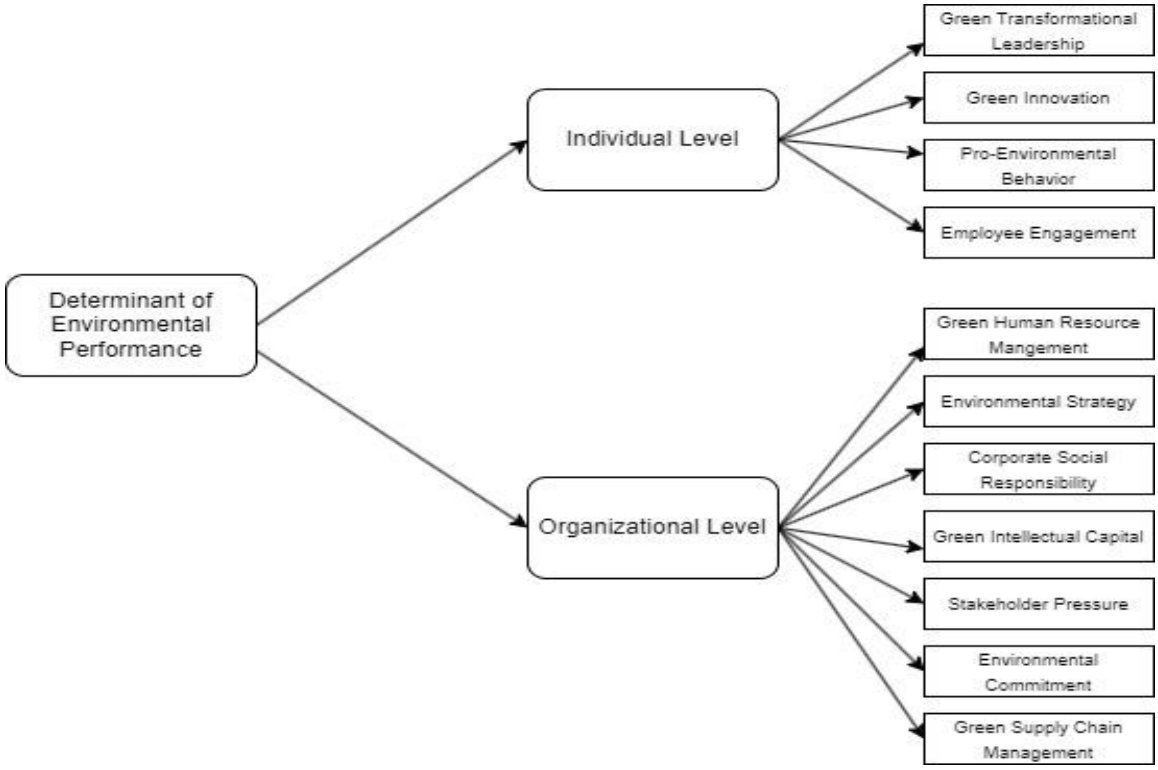

Figure 2. Determinants of Environmental Performance

Research by Singh et al. (2020), which has garnered 741 citations, provides significant insights into the factors supporting environmental performance achievement. Drawing upon resource-based theory and ability, motivation, opportunity (AMO) theory, their study demonstrates that green human resource management (GHRM) practices, green transformational leadership, and green innovation interact as determinant factors in achieving environmental performance. These factors operate at two levels: green transformational leadership and green innovation at the individual level, and GHRM at the organizational level. Conducted in small and medium-scale manufacturing enterprises, this research underscores the crucial role of leadership in influencing HRM practices, predicting green innovation, and supporting environmental performance in organizations. This effect is particularly pronounced in smaller organizations where leadership figures have a more direct impact on organizational vision and practices.

The second most-cited research, conducted by Kraus et al. (2019) in the Malaysian manufacturing sector, explores the influence of corporate social responsibility (CSR) on environmental performance (EP). Their findings indicate that CSR impacts EP through the mediation of environmental strategy and green innovation. This research provides valuable insights for managers, suggesting that environmental performance can be enhanced not only through traditional waste and pollution control measures but also by optimizing CSR programs as a strategy to boost green innovation and EP.

The third highly-cited study by Kraus et al. (2020) examines Malaysian manufacturing organizations that have implemented Green Human Resource Management (GHRM) practices and possess green intellectual capital. Their research demonstrates how these factors can foster green innovation and environmental strategies, thereby supporting the achievement of environmental performance (EP). The study reveals that organizational commitment to environmental policies can enhance employee innovation, serving as a bridge (environmental strategy) to achieving EP. Notably, this research also indicates that green innovation, as an individual-level determinant factor, has a stronger influence on EP achievement compared to organizational-level GHRM practices.

Maksoud et al. (2020) conducted the fourth most-cited research, investigating the influence of stakeholder pressure and eco-control systems on firm performance (economic and environmental) in the UK manufacturing sector. Their study of 93 manufacturers concluded that stakeholders play a significant role in the effectiveness of implementing eco-control systems, which in turn positively impacts environmental performance. The determinants of environmental performance identified in this research were primarily at the organizational level, namely stakeholder pressure and eco-system control. The fifth most-cited research by Aftab et al. (2022) explored the influence of GHRM policies on environmental performance, mediated by green innovation and pro-environmental behavior, and moderated by environmental strategy. Conducted in Pakistan's manufacturing industry, the study found that implementing GHRM policies can improve pro-environmental behavior and increase EP in organizations. The determinant factors identified were GHRM and environmental strategy at the organizational level, and green innovation and pro-environmental behavior at the individual level.

Ghouri et al. (2020) conducted the sixth most-cited research, examining the key indicators of GHRM that most significantly support achieving environmental performance and, consequently, improve business performance. Among the five GHRM indicators studied in the Malaysian manufacturing sector, green training and culture emerged as the most influential factor on EP. The seventh-ranked study by Bhatia & Khumar (2021) investigated the influence of internal (stakeholders) and external (competitors) pressure on environmental performance in India's manufacturing sector. Their findings indicate that stakeholder and competitor pressure, mediated by green process innovation, significantly influences environmental performance. This research identified determinant factors at the organizational level, namely stakeholder and competitor pressure, as well as green process innovation.

The next highly cited research examines the internal and external influence of green practices on environmental performance, moderated by buyer-supplier relations. The findings demonstrate that business processes, from production to delivery, can influence external green practices, particularly in terms of supplier relationships adhering to green values. The integration of strong buyer-supplier relations with organizational practices shows positive effects on environmental performance. This research identifies buyer-supplier relations and internal-external green practices as determinant factors of environmental performance at the organizational level. Graham et al. (2023) conducted the ninth-ranked study, investigating the mediating role of employee engagement in the relationship between green supply chain management (GSCM) and environmental performance in the UK manufacturing sector. Their research, based on a survey of 394 UK manufacturing companies, reveals that employee involvement, facilitated through Green Human Resource Management (GHRM) practices, supports the successful implementation of GSCM practices, which in turn enhances environmental performance. The study

concludes that employee engagement is a determinant factor of environmental performance at the individual level, while GHRM and GSCM are determinant factors at the organizational level.

The tenth most-cited research, conducted by Mahir Uddin in 2020, focuses on the role of GHRM practices on environmental performance in manufacturing organizations in Bangladesh. The study's results indicate that specific GHRM indicators - namely green job analysis and job description, green training, and green reward and compensation - have a significant influence on environmental performance. This research firmly establishes GHRM as a determinant factor of environmental performance at the organizational level. These studies collectively contribute to a growing body of evidence highlighting the complex interplay between organizational practices, employee engagement, and environmental performance in the manufacturing sector across various countries. They underscore the importance of both individual-level factors (such as employee engagement and green innovation) and organizational-level factors (including GHRM, GSCM, and buyer-supplier relations) in achieving superior environmental performance.

Conclusion

This study makes a significant contribution to the field of environmental performance research by synthesizing findings from multiple scientific articles examining various determinants of environmental performance. Through a systematic literature review, the researchers identified eleven key determinants of environmental performance, which they categorized into individual and organizational levels. At the individual level, green innovation emerged as the most prevalent determinant of environmental performance, followed by pro-environmental behavior, green transformational leadership, and employee engagement. The organizational level revealed a broader range of determinants, with Green Human Resource Management (GHRM) practices being the most influential factor. Other significant organizational determinants included stakeholder and competitor pressure, buyer-supplier relations, green intellectual capital, environmental strategy, green supply chain management, corporate social responsibility, and environmental commitment.

The research methodology employed the PRISMA approach, focusing on reviewing the Scopus database with specific inclusion criteria. The publication period considered spanned from 2018 to 2023, a timeframe chosen to coincide with the Paris Agreement on climate change and the subsequent global focus on environmental sustainability as a shared responsibility. Initially, 23,175 records were identified from the selected databases. After applying the inclusion criteria, the final analysis included 32 articles.

These findings underscore the universal importance of environmental performance across organizations, particularly in the manufacturing industry, which is often responsible for significant waste and production process residues. The practical implications of this research are substantial, offering valuable insights for management and HR managers. It suggests that focusing on key determinants of environmental performance, such as implementing effective GHRM practices from recruitment through training, compensation, and employee participation in company green initiatives, can significantly enhance an organization's environmental performance. This comprehensive review not only consolidates current knowledge on environmental performance determinants but also provides a roadmap for organizations seeking to improve their environmental impact. By highlighting both individual and organizational factors, the study offers a holistic approach to enhancing environmental performance, emphasizing the interconnected nature of human resource practices, organizational strategies, and individual behaviors in achieving sustainable environmental outcomes.

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