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CAN GREEN HRM AND HEALTH & SAFETY PAVE THE WAY FOR BETTER PERFORMANCE?

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Abstract**:** *This research aims to analyze the influence of Green Human Resource Management practices on Environmental Performance and Health and Safety as mediating variables. This research was conducted on employees of four manufacturing companies that have ISO 14001 and ISO 45001 in Batam City with 381 respondents. The collected data was analyzed to examine the correlation between the latent variables and evaluate the proposed model, which consists of test validity and reliability, outer loadings, direct effect, indirect effect, and R-Square. Results showed that nine hypotheses were accepted and four hypotheses were not accepted. The research shows that Green HRM practices positively affect the Health and Safety. Green Empowerment and Green Participation further positively affects the Environmental Performance. Furthermore, Green Hiring and Green Training have no influence on Environmental Performance. Health and Safety positively affects the Environmental Performance. Green Hiring and Green Training were not successfully mediated by Health and Safety. The originality of this research is how health and safety successfully mediate the relationship between Green Empowerment and Green Participation on Environmental Performance, where the highest item is Health and Safety_4 proving that manufacturing companies are aware with employee's health check-ups.*

Keywords**:** Environmental Performance, Green Human Resource Management Practices, Health and Safety, ISO

INTRODUCTION

The industrial manufacturing sector faces difficulties in complying with environmental regulations such as global warming, waste management, and limited natural resources (Riyanto and Ong 2020). These concerns can impact long-term sustainability, which is an overall issue. Also, the increasing frequency of climate-related disasters could threaten and impact the global economy. In response, governments and organizations are prioritizing sustainable development. On the other hand, climate change has not only damaged the environment and reduced worker productivity and performance (Chen, Kuo, and Chen 2022).

Green Human Resource Management practices remind employees about the complexities of sustainability management, what needs to be done, and how they can help the environment. Not only is practice required, but knowledge of health and safety is also challenging, thus might impact employee's performance. With this, companies must provide training and increase employees' knowledge on

health and safety during work (Sinaga and Vioito 2022). An effective GHRM practice strategy also involves employees taking the initiative in the workplace environment (Benevene and Buonomo 2020). Therefore, this strategy must be implemented to maintain a balanced work environment (Al-Romeedy 2019).

These challenges have tested management systems, especially for manufacturers. Many manufacturing companies are motivated to minimize the waste generated during production to improve environmental performance. However, it remains uncommon for manufacturing companies to adopt GHRM practices (Ayu et al. 2023).

Batam has developed into a center for manufacturing and electronics industries, attracting multinational companies to shift their semiconductor and component production to the island. This development is fueled by several key advantages, including affordable production costs, availability of skilled labor, strategic location near Singapore that enhances supply chain efficiency, and favorable free trade zone regulations that lower operational expenses for exporters and manufacturers (Batam 2025; Industrial 2024). According to Table 1, Indonesia Statistics from Badan Pusat Statistik/BPS (2023) said that the distribution level of the main sector that provided the largest growth in year 2023 in Batam City is the manufacturing industry sector with a contribution of 121.83 million. Other sectors in the top five are the construction, wholesale and retail trade, financial and insurance, as well as information and communication.

Most companies consider implementation an obstacle if they only focus on improving and developing their work environment systems. Eftimov and Kitanovikj (2023) believe that company awareness and knowledge regarding environmentally friendly implementation must be improved. Hence, the introduction of GHRM practices enable manufacturing companies to be able to manage and monitor their work environment (Riyanto and Ong 2020).

There are legal demands and environmental policies that require companies to act by adopting practices when facing environmental challenges. Many legal policies related to environmental issues have been passed in Indonesia (Pramudita and Gunawan 2023). Based on requests from the government and environmental laws, sustainable environmental performance has become an essential part of companies, prompting the deployment of environmental management systems exemplified by ISO 14001 and ISO 45001 certification. ISO 14001 and ISO 45001 certifications prove that companies express their ethical concern for their workers (Purwanto et al. 2021). Numerous studies have revealed a connection between GHRM practices and improved environmental performance in the manufacturing sector certified under ISO 14001 and 45001 (Khan et al. 2020; Obeidat, Sarhan, and Qasim 2023; Riyanto and Ong 2020; Saeed et al. 2019; Yong et al. 2020). To provide context for the research object, a general overview of the industrial landscape was developed using examples of companies listed by Indonesia Statistics (BPS) (2023).

These companies represent various sectors within the manufacturing industry in Batam, such as electronics, technology, and plastic components that are ISO 14001 & ISO 45001 certified.

Research conducted in the past has explored the association between GHRM practices and health and safety measures. The studies have found various aspects of GHRM activities, including hiring, training, empowerment, and participation, as actions that enhance health and safety. Companies pay attention to the employee recruitment process by prioritizing prospective workers with commitment into occupational health (Maskuroh et al. 2023). Several studies were conducted by Jerónimo et al. (2020), Laurent, Chmiel, and Hansez (2020), and Yong, Yusliza, and Fawehinmi (2020),

Table 1. Gross Regional Domestic Product 2023 In Batam City

No	Sector	Gross Regional Domestic Product
1	Manufacture	121.83 Million
2	Construction	46.13 Million
3	Wholesale and Retail Trade, Automotive repair services	13.17 Million
4	Financial and Insurance	7.33 Million
5	Information and Communication	6.16 Million

Source: Indonesia Statistics (BPS) (2023)

finding that employing individuals who are concerned about the work environment positively influences health and safety. Furthermore, Bayram (2019), Hassan and Siddiqui (2020), and Tezel et al. (2021) highlight that training can improve health and safety, helping companies reduce common workplace accidents. Workers who feel empowered will see safety as their responsibility and tend to increase levels of psychological safety. Several studies conducted by Lee et al. (2019), Nkrumah et al. (2021), Ochoa, Cunha, and Abrantes (2022), and Yıldız et al. (2020), in the medical field stated that empowerment has a positive impact on health and safety. Employee participation is essential for implementing health and safety successfully. Participation will be achieved if they believe in their work and can reduce the number of reportable incidents. Several studies conducted by Bayram, Arpat, and Ozkan (2022), Boczkowska, Niziołek, and Roszko-Wójtowicz (2022), Ghasemi et al. (2020), Kuzmina and Searle (2024), and Lee et al. (2019), stated that participation has a positive impact on health and safety.

The primary aim of this research is to expand knowledge about the linkage between GHRM practices, health and safety, and environmental performance in manufacturing companies. Previous studies have shown that GHRM practices benefit health and safety, but most of this research has focused on the healthcare like Ari et al. (2020), Ghasemi et al. (2020), Lee et al. (2019), and Yıldız et al. (2020), Anwar et al. (2020) and Kuzmina and Searle (2024) on education, along with Maskuroh et al. (2023) and Ochoa, Cunha, and Abrantes (2022) on mining. Research within the manufacturing industry—particularly in companies certified with ISO 14001 and ISO 45001—remains scarce. Moreover, most prior studies have yet to comprehensively examine how health and safety function as a mediating variable between the aspects of green human resource management practices and environmental performance.

This study offers novelty in two ways. First, it introduces green empowerment and green participation as additional dimensions of GHRM practices, which are rarely tested within the Indonesian manufacturing context. Second, it specifically investigates manufacturing companies in Batam City that are certified with ISO 14001 and 45001, addressing a gap in the empirical literature in a highly active industrial region that remains underexplored in terms of GHRM practices and environmental performance. Thus, this study not only tests the direct relationships among variables but also deepens the understanding of the mediating mechanism through health and safety as a pathway to improving environmental performance.

Resource-Based View Theory (RBV)

The basic theory of this research is the RBV. This study investigates how a company's performance and competitive advantage are influenced by the use of their valuable and unique resources (Montalvo-Falcón et al. 2023).

Yong et al. (2020) and Yusliza et al. (2020) claimed that human resources are a firm's most valuable asset that can contribute to the success of sustainability initiatives. The significance of effective human resource practices has been mentioned in studies linking them to increased productivity.

This research examines how GHRM practices impact health and safety through RBV and environmental performance. The study also shows that GHRM practices are fundamental to implementing sustainability and improving environmental performance. The study suggests that GHRM activities are fundamental to implement sustainability and enhancing environmental performance.

Green Human Resource Management Practices (GHRM)

GHRM practices encourage employees to participate actively in environmental sustainability by fostering greater awareness and appreciation green initiatives. This strategy also contributes to build a supportive and healthy work environment, both within and beyond the company, enhancing employees' physical and mental motivation at work (Yusoff et al. 2020).

Green Hiring (GH)

GH allows companies to introduce initiatives to potential job applicants. Candidates can also prepare themselves to become environmentally friendly employees, which is following the standards of a friendly work environment culture. By prioritizing the recruitment of employees who are environmentally aware, companies tend to motivate these employees to further support environmental awareness (Appiah, Segbenya, and Oti 2024; Ari et al. 2020; Jerónimo et al. 2020).

Green Training (GT)

GT unlocks the potential for successful environmental management because training can ensure that employees can take initiative to contribute to the environment. In addition, GT provides individuals and teams with the competencies needed to adopt and environmental practices (Jerónimo et al. 2020; Montalvo-Falcón et al. 2023).

Green Empowerment (GE)

In environmental contexts, empowerment is often called as green empowerment this practice can improve employee performance and company's effectiveness (Ghalavi and Nastiezaie 2020). GE involves granting employees the authority to make decisions in situations that are beyond of standard procedures and can encourage environmentally responsible actions (Ari et al. 2020; Roscoe et al. 2019).

Green Participation (GP)

GP provides a platform for employees to voice their concerns and suggest improvements to environmental practices, leading to a more sustainable company. Employees that are actively involved in their roles tend to believe environment and safety is treated as a top priority. By participating in the environment, employees could offer innovative suggestions for improving environmental and health and safety in company (Anwar et al. 2020; Ari et al. 2020; Bayram, Arpat, and Ozkan 2022).

Health and Safety (H&S)

H&S initiatives aim to safeguard employees from workplace accidents, injuries, and hazardous substances. H&S practices are designed to prevent work-related accidents and ensure the well-being of every employee. Following standard operating procedures is crucial to minimize incidents and sustaining occupational safety standards (Liu, Du, and Zhou 2022). Companies have a responsibility to safeguard their employees by taking proactive steps to minimize accident risks and provide a safe working environment (Ahmad and Iqbal 2022). H&S are considered very important for the welfare of workers from the perspective of

the practices and policies that will be adopted by the company (Silva and Amaral 2019). H&S aim to safeguard and enhance both the physical and mental of employees across all types of jobs (Haidarravy, Apni, and Safrizal 2023).

Environmental Performance (EP)

Ren and Hussain (2022) defined the EP as company's dedication in minimizing waste, sustainable sourcing, and environmentally friendly operations. Effective EP requires a skilled workforce (Yusoff et al. 2020). An employee's performance can be evaluated based on how effectively they contribute to the company's sustainability initiatives (Fang et al. 2022). Many actions taken by employees in responding to environmental issues in the workplace are not always planned. However, employees can improve EP by taking appropriate actions when necessary (Ojo, Tan, and Alias 2022).

Effect of GH on H&S

GH enhances a company's H&S by favoring candidates who exhibit awareness of H&S norms in the workplace (Maskuroh et al. 2023). This includes employing workers who exhibit safe behavior and regard H&S as an integral part of their job responsibilities (Laurent, Chmiel, and Hansez 2020). Job descriptions should require knowledge of H&S practices that impact the environment, particularly those that have implications for environmental safety. Therefore, management should consider these aspects across all workplace functions, starting from employee selection to production processes (Jerónimo et al. 2020; Yong et al. 2020). Candidates who are environmentally conscious tend to value clean, hazard-free, and regulated work environments, which are key to H&S. Furthermore, GH also involves safety-related competencies and awareness in job descriptions and interview criteria, ensuring that new employees are more inclined to demonstrate safe conduct and adhere to safety regulations (Saeed et al. 2019). By embedding occupational safety indicators into GH criteria, companies can strengthen their safety culture from the entry point of employment.

H_1: GH has a positive effect on H&S

Effect of GT on H&S

Effective GT can reduce workplace accidents by improving awareness and H&S practices. GT does not only cover environmental policies, but also integrates H&S procedure by encouraging employees to adopt safer work habits, handle materials responsibly, and identify workplace hazards. Companies that implement continuous GT programs promote a safety culture where employees are more engaged and proactive in minimizing risks, leading to improved H&S outcomes (Ateeq et al. 2024; Bayram 2019; Hassan and Siddiqui 2020; Tezel et al. 2021).

H_2: GT has a positive effect on H&S

Effect of GE on H&S

GE refers to driving employee's commitment to participate in making decisions concerning environmental and safety-related initiatives (Yıldız et al. 2020). Bilek et al. (2022) showed that employees with higher levels of empowerment tend to be more transparent and responsible in addressing workplace risks, and are more likely to report injuries accurately. The motivation of empowered employees can be strengthened by providing access to resources, relevant information, and support for a higher level of empowerment. Moreover, empowerment fosters psychological safety, which enables employees to report hazards, follow procedures, and engage in H&S practices (Lee et al. 2019; Nkrumah et al. 2021; Ochoa, Cunha, and Abrantes 2022; Yıldız et al. 2020).

H_3: GE has a positive effect on H&S

Effect of GP on H&S

GP is essential for addressing H&S concerns that affect workers. Involving employees in environmental as well as H&S matters is essential for the effective execution of

a safety management system and fostering a strong safety culture within the company. Companies must be able to build an excellent environmental culture, where workers are encouraged to share knowledge and participate in H&S practice (Bayram, Arpat, and Ozkan 2022; Boczkowska, Niziołek, and Roszko-Wójtowicz 2022; Kuzmina and Searle 2024; Lee et al. 2019). Employees who trust in the company's dedication to workplace safety are more inclined to take part in GP activities, which can reduce the number of reportable incidents and improve H&S outcomes (Ghasemi et al. 2020; Kuzmina and Searle 2024).

H_4: GP has a positive effect on H&S

Effect of H&S on EP

Focusing on workplace, H&S can reduce injuries and accidents through the identification and control of potential hazards. This can be achieved by offering safety training and supplying suitable protective tools, thus companies can improve worker H&S practices (Tafere, Beyera, and Wami 2020). Companies should proactively provide safety materials and educate employees about safety procedures. A well-maintained and clean workplace not only reduces accidents but also minimizes pollution, and material waste, thus contributing to better EP. Employees must be responsible for H&S, which will help maintain the work environment and operate safely (Baluti et al. 2024; Cahya Susena and Rahman 2022; Haidarravy, Apni, and Safrizal 2023; Hou et al. 2021; Hasna, Kurniawati, and Arida 2023; Quaigrain et al. 2024; Sentoso and Muchsinati 2024; Tan, Tan, and Choong 2023).

H_5: H&S has a positive effect on EP

Effect of GH on EP

GH has a meaningful relationship with EP (Kuo et al. 2022; Malik et al. 2020; Shafaei, Nejati, and Mohd Yusoff 2020). It supports the company's environmental strategy by facilitating the recruitment of candidates who are dedicated to sustainability and aligned with the company's green goals. Companies select candidates who can commit to the environment and are willing to implement the company's environmentally friendly programs. Also, companies must provide information about environmentally friendly goals and state workers' expectations regarding environmentally friendly practices in the job descriptions provided. If the hiring process is carried out well, this can affect worker productivity and performance (Muchsinati, Oktalia, and Priscilla 2024). An effective hiring process not only enhances employee productivity and performance, but also reduces operational costs and supports the development of individuals with environmental expertise.

H_6: GH has a positive effect on EP

Effect of GT on EP

Jerónimo et al. (2020) concluded that GT can strengthen employees by improving ability to recognize environmental issues and suggest effective solutions. Appiah Kissi, Segbenya, and Oti (2024), Ojo, Tan, and Alias (2022), Pham, Hoang, and Phan (2020), Yafi, Tehseen, and Haider (2021), and Yusoff et al. (2020) said that GT programs can provide workers with relevant environmental knowledge, which in turn can raise their environmental awareness and encourage them to improve their EP. With specialized training, workers can take responsibility for reducing a company's environmental footprint (Kuo et al. 2022; Montalvo-Falcón et al. 2023; Pinzone et al. 2019). As a result, they are more inclined to embrace environmental practices at work, leading to better environmental outcomes for the company.

H_7: GT has a positive effect on EP

Effect of GE on EP

Companies can enhance their EP by encouraging employee involvement in environmentally sustainable initiatives (Ojo, Tan, and Alias 2022). Companies can empower and motivate employees by sharing information about environmental goals and inviting them to

suggest solutions for environmental challenges. When employees feel empowered, they tend to take initiative to make decisions, and take responsibility for addressing actions that may harm the company's operations (Anwar et al. 2020; Febiola, Donal, and Setyawan 2024; Hameed et al. 2020; Roscoe et al. 2019; Muchsinati and Fairly 2023; Yuwono, Danito, and Nainggolan 2023).

H_8: GE has a positive effect on EP

Effect of GP on EP

Employees take part in fostering the company's green practices by participating in environmental decision-making, proposing innovative ideas for a greener workplace, and sharing suggestions for improvement (Ari et al. 2020). Growing employee voices through involvement in sustainability efforts and contributing ideas to resolve environmental concerns. When employees voluntarily implement environmental actions, they keep themselves informed about the environmental programs and promote their adoption among employees that lead to improve EP. Worker participation in environmental management decision-making can improve their self-regulation and problem-solving abilities (Anwar et al. 2020; Fazal-e-Hasan et al. 2023; Gill, Ahmad, and Kazmi 2021; Laulita 2021; Montalvo-Falcón et al. 2023; Pham, Hoang, and Phan 2020).

H_9: GP has a positive effect on EP

Effect of GH on EP Mediated by H&S

GH focuses on recruiting employees that are aware of and committed to environmental and health safety in the workplace. By prioritizing candidates with a strong commitment to environmental and H&S, companies can strengthen their culture of the environmental safety, ultimately leading to enhance environmental outcomes (Maskuroh et al. 2023; Obeidat, Sarhan, and Qasim 2023).

H_{10}: GH has a positive effect on EP mediated by H&S

Effect of GT on EP Mediated by H&S

GT must educate employees on environmental practices related to waste reduction, safety, and recycling. The GT helps improve workplace H&S by promoting safer behaviors and reducing environmental risks by recycle materials, reuse products, as well as reduce the use of materials and packaging. As a result, improved H&S conditions support better EP in the company (Mousa and Othman 2020; Obeidat, Sarhan, and Qasim 2023; Raut et al. 2020).

H_{11}: GT has a positive effect on EP mediated by H&S

Effect of GE on EP Mediated by H&S

A safe working environment contributes to employee GE. When employees feel supported by H&S in workplace, they tend to exhibit greater initiative in their actions. This aligns with the concept of GE, where employees are encouraged to take part in responsible decisions and actions to environmental. The combination of GE and H&S specifically enhances EP through improved performance by employee (Tan, Tan, and Choong 2023; Xie et al. 2023). Moreover, a safe and healthy work environment not only fosters employees' confidence to engage in green initiatives but also reduces the psychological barriers that can hinder proactive environmental behavior. When occupational risks are minimized, employees are more likely to dedicate cognitive and emotional resources toward sustainability practices, such as waste reduction and energy conservation. This supportive climate reinforces the perception that environmental performance is a shared organizational priority rather than an individual burden. As a result, health and safety measures serve as an enabling factor that strengthens the positive link between green engagement and environmental outcomes.

H_{12}: GE has a positive effect on EP mediated by H&S

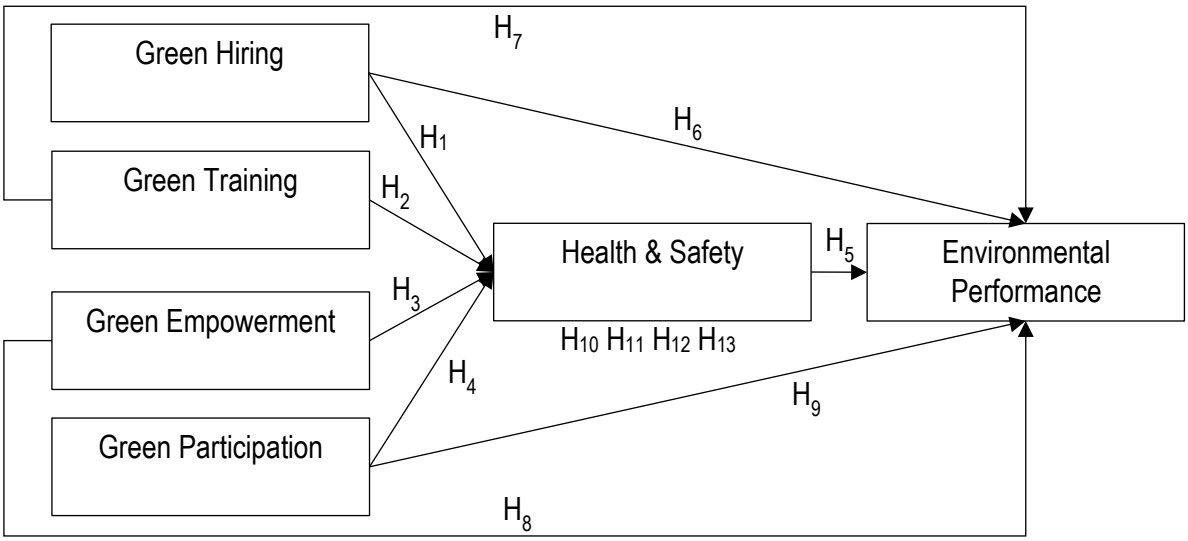

Figure 1. Research Model
Sources: Ari et al. (2020) and Maskuroh et al. (2023)

Effect of GP on EP Mediated by H&S

When the GP is embedded within H&S in work, it can extend beyond workplace safety to support EP. Employees who are engaged in maintaining safety standards are more likely to exhibit environmentally responsible behaviors, including proper waste management, pollution prevention, and adherence to environmental regulations (Bathan and Ashipaoloye 2023; Shahbaz and Sajjad 2020).

H_{13}: GP has a positive effect on EP mediated by H&S

METHOD

The target population of this research consists of employees working in the manufacturing sector in Batam City. This research used purposive sampling that targeting employees from large-scale manufacturing companies in Batam City that are certified ISO 14001 and ISO, as categorized by Indonesia Statistics (BPS) (2023). Companies with these certifications are committed to continuous improvement in environmental and H&S practices (Ojo, Tan, and Alias 2022; Yong, Yusliza, and Fawehinmi 2020), making them suitable objects for examining the mediating effect of H&S in the linkage GHRM practices and EP. Out of 16 identified companies, 4 agreed to participate and completed the questionnaire: PT Sat Nusapersada Tbk; PT Honfoong Plastic Industries; PT Pegaunihan Technology Indonesia; and PT Cladtek Bi-Metal Manufacturing. Respondents were required to have worked for at least a year to be familiar with GHRM practices. The sample size used was measured using the formula proposed by Hair et al. (2019) that multiplying the number of questionnaire questions by 10. Given that this study includes 33 questionnaire items, the required sample are 330 respondents.

The research primary data was collected from target manufacturing companies using online questionnaires distributed through Google Forms. Questionnaires were distributed as sampling data to know whether the intended research object has implemented GHRM practices and H&S. Additionally, the questionnaires were distributed to 16 companies between November 2023 and January 2024. Prior to distribution, permission was obtained by approaching the HR managers of these companies, and the process continued after approval.

By 33 questions for the questionnaire, the data analysis results for variables included

the measurement of the GH variable was adopted from Mousa and Othman (2020) through five questions, GT was adopted from Mousa and Othman (2020) through five questions, GE was adopted from Roscoe et al. (2019) through five questions, and GP was adopted from Anwar et al. (2020) through six questions. To measure H&S, six questions were adopted from Tan, Tan, and Choong (2023) and the other six questions were adopted from Ojo, Tan, and Alias (2022). to measure EP. Each question was measured based on a five-point likert scale, namely: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly Agree (5). With primary data collected from 381 respondents, the data was then analyzed using the Partial Least Squares-Structural Equation Modeling (PLS-SEM) approach, employing the SmartPLS 3 software to assess the influence of independent variables on the dependent variable through a mediating variable that consist of test validity and reliability, outer loadings, direct effect, indirect effect, and R-Square.

RESULTS

Respondents' demographics refer to the background characteristics of the individuals participating in a study. Primary data was used to process data obtained directly from distributing questionnaires to 381 respondents who have become samples. Table 2 indicates that the majority of respondents are female respondents, with a percentage of 57.74%, while the total number of male respondents is 42.25%. Companies prefer female workers because of their thoroughness and discipline in the Batam manufacturing industry (Fajrah and Zetli 2023). Approximately 77.95% of the respondents are aged between 17 and 30 years, young workers tend to be more productive, supported by physical strength that is still strong and healthy compared to older workers. Increasing age will decrease work productivity because physical abilities decrease (Attaqi 2022). Most respondents possess an educational background at the high school level or equivalent by 59.05%, and there is more high school graduates than bachelor graduates looking for work in manufacturing in Batam City because the manufacturing industry provides promising

Table 2. Respondents' Demographics

Profile	Classification	Frequency	Percentage
Gender	Female	220	57.74%
	Male	161	42.26%
Age (years)	17 – 30	297	77.95%
	31 – 40	62	16.27%
	41 – 50	17	4.46%
	>51	5	1.31%
Education (degree)	High School/Equivalent	225	59.06 %
	Diploma	21	5.51%
	Bachelor	129	33.86%
	Master	4	1.05%
	Doctoral	2	0.52%
Length of work (years)	Minimum 1	96	25.20%
	1 - 2	137	35.96%
	3 – 4	87	22.83%
	>4	61	16.01%

opportunities for workers for high school graduates. Also, those who have completed their education in high school are ready to enter the world of work and begin their career (Erda and Khurniawan 2019). The longest working period is 1 to 2 years by 35.95%. With the 1-2 years required, individual potential can be created gradually from experience over time. Individual abilities are also needed to understand and acquire skills from the job owned (Attaqi 2022).

Validity ensures that the instrument truly captures the intended variable, while reliability refers to consistently similar results under the same conditions (Hair et al. 2019). Table 3 shows that a variable is declared to have a good level of reliability when the Composite Reliability exceeds 0.7 (Hair et al. 2019). Based on the results of the reliability test, all variables have a Composite Reliability value greater than 0.70, which indicates the measurement instrument has a good level of reliability. All Average Variance Extracted (AVE) values show more than 0.5, meaning each construct has good and effective convergent validity.

Outer loading indicates how strongly an observed variable is linked to its underlying construct. Table 4 shows that (Hair et al. 2019) indicators that are not significant must be removed for outer loading values below 0.6. An indicator is declared to have met the convergent validity criteria if it has a correlation value >0.6. In this case, all indicators show an outer loading value greater than 0.60.

Table 3. Validity and Reliability

Variables	Composite Reliability	AVE
GH	0.780	0.541
GT	0.825	0.541
GE	0.803	0.576
GP	0.822	0.536
H&S	0.816	0.527
EP	0.831	0.551

Table 4. Outer Loadings

Variable	EP	GE	GH	GP	GT	HS
EP_1	0.757					
EP_2	0.731					
EP_3	0.751					
EP_4	0.731					
GE_1		0.735				
GE_3		0.815				
GE_4		0.724				
GH_1			0.761			
GH_4			0.695			
GH_5			0.750			
GP_1				0.690		
GP_2				0.732		
GP_4				0.768		
GP_6				0.738		

Variable	EP	GE	GH	GP	GT	HS
GT_1					0.730	
GT_2					0.750	
GT_3					0.754	
GT_4					0.706	
HS_3						0.763
HS_4						0.773
HS_5						0.656
HS_6						0.707

Table 5. Fornell-Larcker Criterion

Variables	EP	GE	GH	GP	GT	HS
EP	0.742	-	-	-	-	-
GE	0.622	0.759	-	-	-	-
GH	0.520	0.492	0.736	-	-	-
GP	0.607	0.576	0.556	0.732	-	-
GT	0.571	0.506	0.592	0.687	0.735	-
H&S	0.611	0.561	0.530	0.648	0.588	0.726

The Fornell-Larcker criterion is commonly applied to determine the presence of discriminant validity. Table 5 shows that the correlation value on the diagonal line meets the criteria because the construct shows good discriminant validity as its correlation with itself is stronger than with other variables (Hair et al. 2019).

Based on Table 6, result shows that H_1 is accepted where GH has a positive effect on H&S with (β = 0.150, t = 1.979, p = 0.048). The results of this research are in line with previous research conducted by Jerónimo et al. (2020), Laurent, Chmiel, and Hansez (2020), Maskuroh et al. (2023), and Yong, Yusliza, and Fawehinmi (2020) that GH contribute positively to a company's H&S favoring candidates who exhibit awareness of H&S norms in the workplace. By embedding occupational safety indicators into GH criteria, companies can strengthen their safety culture.

H_2 is also accepted where GT has a positive effect on H&S with (β = 0.163, t = 2.316, p = 0.021). The results of this research are in line with research conducted by Ateeq et al. (2024); Bayram (2019), Hassan and Siddiqui (2020), and Tezel et al. (2021) who have highlighted that effective training can reduce workplace accidents by improving awareness and H&S practices. Companies that implement continuous GT programs promote a safety culture where employees are more engaged and proactive in minimizing risks, leading to improved H&S outcomes.

H_3 is accepted where GE has a positive effect on H&S with (β = 0.217, t = 3.527, p = 0.000). The results of this research are in line with research conducted by Bilek et al. (2022), Lee et al. (2019), Nkrumah et al. (2021), Ochoa, Cunha, and Abrantes (2022), and Yıldız et al. (2020), stated that employees with higher levels of empowerment tend to be more transparent and responsible in addressing workplace risks, and are more likely to report injuries accurately.

H_4 is accepted where GP has a positive effect on H&S with (β = 0.323, t = 4.580, p = 0.000). The results of this research are in line

Table 6. Direct Effect Test

No	Variables	Coefficient	T Statistics	P Values
H1	GH → HS	0.150	1.979	0.048
H2	GT → HS	0.163	2.316	0.021
H3	GE → HS	0.217	3.527	0.000
H4	GP → HS	0.323	4.580	0.000
H5	HS → EP	0.218	3.062	0.002
H6	GH → EP	0.099	1.631	0.104
H7	GT → EP	0.130	1.735	0.083
H8	GE → EP	0.300	4.481	0.000
H9	GP → EP	0.148	2.360	0.019

with research conducted by Bayram, Arpat, and Ozkan (2022), Boczkowska, Niziołek, and Roszko-Wójtowicz (2022), Kuzmina and Searle (2024), and Lee et al. (2019), who stated that GP is the key for addressing H&S concerns that affect workers. Involving employees in environmental and H&S is more effective and able to fostering a strong safety culture within the company.

H_5 is also accepted where H&S have a positive effect on EP with (β = 0.218, t = 3.062, p = 0.002). The results of this research are in line with research conducted by Baluti et al. (2024); Cahya Susena and Rahman (2022), Haidarravy, Apni, and Safrizal (2023), Hou et al. (2021), Hasna, Kurniawati, and Arida (2023), Quaigrain et al. (2024), Sentoso and Muchsinati (2024), and Tan, Tan, and Choong (2023), who found that focusing on workplace H&S can reduce injuries and accidents. This can be achieved by supplying suitable protective tools in order to improve employee's H&S in work.

Furthermore, H_6 is rejected since GH has a negative effect on EP with (β = 0.099, t = 1.631, p = 0.104). The results of this study are inconsistent with the study conducted by Kuo et al. (2022), Malik et al. (2020), Montalvo-Falcón et al. (2023), and Yusoff et al. (2020), who revealed that hiring has a relationship with EP. It supports the company's environmental strategy by facilitating the recruitment of candidates who are dedicated to sustainability and aligned with the company's green goals. An effective hiring process can enhance productivity and performance, and further reduces operational costs and supports.

H_7 is also rejected where GT has a negative effect on EP with (β = 0.130, t = 1.735, p = 0.083). Appiah, Segbenya, and Oti Amoah (2024) believe that companies need to invest more in human resources through environmentally friendly training programs, resulting in a lack of employees' understanding of environmental friendliness. However, the results of this study are inconsistent with the study conducted by Kuo et al. (2022), Montalvo-Falcón et al. (2023), Ojo, Tan, and Alias (2022), Pham, Hoang, and Phan (2020), Pinzone et al. (2019), Yafi, Tehseen, and Haider (2021), dan Yusoff et al. (2020), who discovered that GT can strengthen employees by improving ability to recognize environmental issues and suggest effective solutions.

H_8 is accepted where GE has a positive effect on EP with (β = 0.300, t = 4.481, p = 0.000). The results of this research are in line with research conducted by Anwar et al. (2020); Febiola, Donal, and Setyawan (2024), Hameed et al. (2020), Roscoe et al. (2019), Muchsinati and Fairly (2023), and Yuwono, Danito, and Nainggolan (2023), that the company can empower and motivate employees by sharing information about environmental goals. When employees feel empowered, they tend to take initiative to make decisions, and take

responsibility for addressing actions that may harm the company's operations.

H_9 is accepted where GP has a positive effect on EP with (β = 0.148, t = 2.360, p = 0.019). The results of this research are in line with research conducted by Anwar et al. (2020), Fazal-e-Hasan et al. (2023), Gill, Ahmad, and Kazmi (2021), Laulita (2021), Montalvo-Falcón et al. (2023), and Pham, Hoang, and Phan (2020), who stated that employees contribute by participating in environmental decision-making, sharing suggestions for environmental improvement. When employees voluntarily implement environmental actions, they keep themselves informed about the environmental programs and promote their adoption among employees that lead to improve EP.

The indirect effect test examines whether and how much the mediating variable carries the effect of an independent variable to a dependent variable (Hair et al. 2019).

Table 7 shows the H_{10} is rejected since GH on EP mediated by H&S with (β = 0.032, t = 1.632, p = 0.103). The result shows that GH does not increase EP that mediated by H&S. However, Maskuroh et al. (2023), and Obeidat, Sarhan, and Qasim (2023) stated that by prioritizing candidates with a strong commitment to environmental and H&S, companies can strengthen their culture of the environmental safety, ultimately leading to enhance environmental outcomes.

H_{11} is also rejected since GT on EP mediated by H&S with (β = 0.035, t = 1.925, p = 0.055). The result shows that GT does not increase EP that mediated by H&S. However, Mousa and Othman (2020), Obeidat, Sarhan, and Qasim (2023), and Raut et al. (2020) showed that GT helps improve workplace H&S by promoting safer behaviors and reducing environmental risks by recycle materials, and minimize the consumption of materials and packaging.

H_{12} is accepted because GE has a positive effect on EP mediated by H&S with (β = 0.048, t = 2.062, p = 0.040). The results of this research are in line with research conducted by Tan, Tan, and Choong (2023) and Xie et al. (2023), who stated that when employees feel supported by H&S in workplace, they tend to exhibit greater initiative in their actions.

H_{13} is also accepted since GP has a positive effect on EP mediated by H&S with (β = 0.070, t = 2.524, p = 0.012). The results of this research are in line with research conducted by Bathan and Ashipaoloye (2023) and Shahbaz and Sajjad (2020), stated that employees who are engaged in maintaining safety standards are more likely to exhibit environmentally responsible behaviors, including proper waste management, pollution prevention, and adherence to environmental regulations.

Table 7. Indirect Effect Test

No	Variables	Coefficient	T Statistics	P Values
H10	GH → HS → EP	0.032	1.632	0.103
H11	GT → HS → EP	0.035	1.925	0.055
H12	GE → HS → EP	0.048	2.062	0.040
H13	GP → HS → EP	0.070	2.524	0.012

Table 8. Results of R-Square

Variable	R Square	Conclusion
EP	0.544	Moderate
H&S	0.515	Moderate

This R-Square coefficient shows how much of the dependent variable's variance is explained by the model's independent variables. Table 9 shows the R-Square coefficient of the determination table.In this case, it is explained that GH, GT, GE, and GP can explain around 54.40% of the EP variable. The remainder, around 45.60% of the variation, is not explained in this study. Based on the R-Square coefficient of the determination table, it is explained that H&S explain around 51.50% of the variables GH, GT, GE, and GP, and other variables are amounting to 48.50% which are not explained. Both variables demonstrate moderate strength, as their R-Square coefficients lie within the 0.50 to 0.70 range, which means that the variable explained a fair but not complete portion of the outcome construct. It indicates that the model is acceptable while acknowledging that there is still an unexplained variable that could be difficult to measure (Hair et al. 2019).

CONCLUSION

This research seeks to examine the effect of GH, GT, GE, and GP as independent variables on EP, with H&S serving as a mediating variable in the context of Batam City manufacturing companies that have ISO 14001 and ISO 45001 in Batam City, with 381 respondents.

The company need to ensure that the recruitment process promotes safety performance indicators such as ISO 14001 and ISO 45001 certifications to signal the company's commitment to environmental practices. This helps attract candidates who want to work for a responsible employer. By training, companies can create modules that combine standard safety protocols with environmental management practices to reduce or prevent accident in work. Through multiple empowerment platforms, employees can be motivated to take part in environmental initiatives by offering related to H&S, and environmental improvements. By actively involving employees, company should set environmental targets, and monitor performance through regular meetings. Employees need to be ensured such as information, and tools for implementing systems where employees can give feedback on company environmental's goals, suggest improvements, report hazards, track progress, and share best practices. The company can also use integrated dashboards that report H&S incidents and EP indicators, then regularly review data to identify correlations between workplace safety improvements and environmental benefits.

The research is limited to ISO 14001 and 45001-certified manufacturing companies in Batam City. The results of this study have proven RBV theory by Montalvo-Falcón et al. (2023), Yong et al. (2020), and Yusliza et al. (2020), where human resource is positioned as a strategic asset that enables manufacture ISO 14001 and 45001 in Batam City to leverage their unique and valuable internal resources by applying the practices to improve EP.

By focusing on manufacturing companies in Batam City that have ISO 14001 and ISO 45001 certifications, this research addressed a relatively underexplored regional context. The unique setting helps to bridge the gap between GHRM theories and their practical implementation, offering insights that may not be generalized from studies conducted in uncertified companies. The novelty of this research lies in GP & GE as new indicators in evaluating EP. These two constructs demonstrate a mediating effect through H&S practices, reinforcing their role in enhancing EP. Notably, the item H&S_4 is the highest and indicating strong agreement that regular health check-ups are mandatory for employees and are recognized by the companies. This finding highlights the importance of proactive H&S policies in supporting environmentally responsible practices. Here, the company has provided health insurance to cover employee medical check-ups at least once a year.

Additionally, the study only examined a few dimensions of GHRM practices, such as

hiring, training, empowerment, and participation. To gain comprehensive understanding, future studies are encouraged to explore the service sector, including industries such as hotels and hospitals, and to incorporate additional GHRM practices such as performance management and compensation. A stronger research methodology and a more diverse sample are also needed to validate the findings in achieving environmental sustainability in manufacturing industry in Batam City.

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APPENDIX

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

No	Statement	Answer				
Green Hiring						
1	Environmental factors are included in job descriptions.	1	2	3	4	5
2	My company's strong EP attracts top talent.	1	2	3	4	5
3	The company where I work prioritizes candidates who understand and aware of green practices.	1	2	3	4	5
4	My company's recruitment messages emphasize environmental responsibility and commitment.	1	2	3	4	5
5	Job roles are specifically designed to contribute to my company's environmental management efforts.	1	2	3	4	5
Green Training						
1	Employees at my company receive comprehensive training on environmental management.	1	2	3	4	5
2	When designing training programs, my company considers environmental impact and knowledge needs.	1	2	3	4	5
3	New hires at my company receive environmental awareness training during their onboarding program.	1	2	3	4	5
4	My company offers online training materials for employee convenience and environmental responsibility.	1	2	3	4	5
5	My company prioritizes environmental training.	1	2	3	4	5
Green Empowerment						
1	I understand how my daily tasks contribute to my company's environmental target.	1	2	3	4	5
2	I feel encouraged to voice my concerns about environmental matters.	1	2	3	4	5
3	I feel empowered to make decision for environmental in work.	1	2	3	4	5

No	Statement	Answer				
4	I have the freedom to implement environmentally friendly practices.	1	2	3	4	5
5	I feel proud to contribute company's environmental target.	1	2	3	4	5
Green Participation						
1	The company provides a clear strategic vision that guides employee actions that are connected to sustainability management.	1	2	3	4	5
2	Employees at my company learn from each other to promote green behaviors and awareness.	1	2	3	4	5
3	There is active employee participation in advancing EP and resolving environmental concerns.	1	2	3	4	5
4	I am given the chance to participate in environmental management through any platform.	1	2	3	4	5
5	My company uses various communication channels to raise environmental consciousness.	1	2	3	4	5
6	My company encourages a committed and responsible approach to environmental sustainability.	1	2	3	4	5
Health and Safety						
1	Safety regulations are implementable in my company.	1	2	3	4	5
2	Even during busy periods, safety regulations are strictly applied in my company.	1	2	3	4	5
3	My company conducts pre-employment health checks for all new hires.	1	2	3	4	5
4	Regular health check-ups are mandatory for employees.	1	2	3	4	5
5	My company actively works to eliminate possible risks to health and safety.	1	2	3	4	5
6	My company prioritizes the safety of all employees, including those with specific needs, during risk assessments.	1	2	3	4	5
Environmental Performance						
1	My company minimizes changes in air quality levels.	1	2	3	4	5
2	My company minimizes wastewater.	1	2	3	4	5
3	My company minimizes solid waste.	1	2	3	4	5
4	My company prioritizes using safer alternatives to minimize dependence on harmful materials.	1	2	3	4	5
5	My company have worked diligently to prevent environmental accidents.	1	2	3	4	5
6	My company consistently enhances its EP.	1	2	3	4	5

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