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The Effect of Green Human Resource Management Practices on Environmental Management Systems: A Field Study of Cement Factories in Yemen

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Abstract

Purpose: This study sought to analyze the effect of green human resource management practices (green recruitment, green training, green compensation and rewards, and green performance appraisal) on environmental management systems in cement factories in Yemen, and to assess the extent to which these practices are applied within the sector. Methodology: A descriptive-analytical approach was adopted. A total of 305 questionnaires were distributed to administrative employees across four cement factories; 292 were returned, of which 281 were valid for analysis. Data were analyzed using descriptive statistics. Findings: The results revealed a strong, statistically significant positive relationship between green human resource management practices and environmental management systems in Yemeni cement factories. The level of influence exerted by these practices was found to be relatively high, with variation in the strength of effect across its dimensions, while the application of environmental management systems reached a relatively advanced level. The study concludes that green human resource management practices contribute effectively to strengthening environmental management systems, although their institutional activation still requires further development and integration.

Keywords: Green Human Resource Management Practices, Environmental Management Systems, Cement Factories, Yemen.

Introduction

Academic attention to environmental management systems (EMS) has grown markedly in recent years, with such systems regarded as a vital operational tool through which organizations translate their environmental commitments into practical action. These systems are no longer an administrative luxury but a strategic necessity (Al-Taher & Shaaban, 2021: 28). They provide the policies, procedures, and action plans

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needed to prevent pollution and reduce environmental impact, while simultaneously embodying the organization's social responsibility, thereby enabling it to achieve better environmental performance and gain sustainable competitive advantage in the market (Renwick, Redman, & Maguire, 2013: 8).

Translating these policies into tangible reality at the organizational level requires activating the human resource in a way that links the policies of environmental management systems with those of human resource management. This connection gave rise to the concept of green human resource management (GHRM) as an innovative strategic tool concerned with applying policies and practices designed to instill environmental awareness among employees and motivate their environmentally friendly behavior (Eyupoglu & Ercantan, 2022: 1). These practices align employees' goals with the organization's environmental objectives, helping to build internal green capabilities that support a strategic orientation toward a sustainable environment (Abu Rumman & Al-Siddiqi, 2019: 46).

In Yemen, the government has been working diligently to protect the environment, curb environmental pollution, enact regulations and bylaws on environmental protection, and incorporate environmental considerations into economic development plans at all levels.

Cement factories in Yemen, which represent one of the country's vital sectors through their contribution to infrastructure and reconstruction projects, nonetheless continue to face substantial environmental challenges owing to their energy consumption and carbon emissions, making them among the most prominent sources of industrial pollution. Under Yemen's current environmental and economic conditions, studying this sector carries particular importance given the potential for generating broad positive impact through the adoption of green management practices that strengthen environmental management systems and help mitigate the sector's adverse environmental effects. This consideration prompted the researcher to examine the role of green human resource management practices in the environmental management systems of cement factories in Yemen.

Conceptual and Operational Definitions

The operational meanings of several terms used in the body of the study are clarified below.

Green Human Resource Management Practices

Anjana Nath, Regional Head of Human Resources at Fortis Healthcare Limited, defined green human resources as environmentally friendly human resource initiatives that lead to greater efficiency, lower costs, and higher levels of employee engagement (Pangarkar, 2021).

Green human resource management practices may be defined as a set of initiatives aimed at attracting, developing, and encouraging environmentally committed employees who are capable of contributing to the organization's environmental objectives and of fostering a green work culture within the workplace.

Environmental Management Systems

An environmental management system is defined as a component of the management system used to manage environmental aspects and to ensure compliance with obligations and risks associated with threats and opportunities (Nasution et al., 2021: 2). Environmental management systems may also be defined as a set of administrative policies and procedures that an organization adopts to control its environmental impacts and to continuously improve its environmental performance, ensuring compliance with environmental requirements and the sustainability thereof.

Human Relations Theory

The human relations movement emerged in response to widespread criticism of scientific management theory, which regarded workers as mere machines that could be programmed to maximize output, thereby disregarding their human needs and motivations (Salatnia, 2003: 40).

In this context, the studies of Elton Mayo-known as the Hawthorne studies, conducted between 1926 and 1932-played a pivotal role in redirecting management researchers' attention toward the human dimension of work. These studies revealed a close link between workers' behavior and their feelings toward the work environment, and demonstrated that the groups to which individuals belong significantly influence their performance and standards. The studies also showed that non-material incentives, such as a sense of belonging and recognition, are more effective in motivating workers than material incentives (Al-Taweel, 2001).

Building on this, human relations theory can be interpreted as indicating that a healthy and accommodating work environment encourages employees to increase their participation in improving the organization's environmental performance, thereby contributing to environmental development goals.

General Systems Theory

The primary aim of general systems theory is to establish an analytical framework that facilitates an understanding of the integration among the components of the administrative system and identifies the variables that influence these integrations. It further seeks to arrive at the principles and laws governing the course of administrative operations and directing them toward achieving prescribed objectives and delivering expected benefits (Shuhaib, 1978).

Barnard laid the foundations of the theory and offered an analysis of the characteristics of the forces influencing the organization-namely the individual, the manager, the total organization, and the environment-regarding the organization as an interlocking, integrated system designed to achieve cooperative behavior and satisfaction (Mar'i, 2002).

Within the context of this study's variables, green human resource management practices represent the inputs of organizational systems, as they contribute to strengthening human capabilities and preserving the environment. Environmental management systems, in turn, represent the processes that ensure balanced and integrated effective management of environmental and human resources. The outputs are reflected in the achievement of

organizational objectives related to profitability and competitiveness through enhanced environmental performance. In other words, green human resource management practices are directed toward achieving the organization's environmental protection objectives.

Stakeholder theory holds that organizations should not focus solely on serving shareholders' interests but should also take into account the interests of all parties affected by, or capable of affecting, their activities, such as employees, the community, the environment, customers, suppliers, government agencies, and other interested parties. According to Freeman, a stakeholder is any individual or group that can affect or be affected by the achievement of the organization's objectives (Freeman, 1984).

The Concept of Green Human Resource Management Practices

Opatha and Arulrajah (2014) defined green human resource management as the green policies, practices, and organizational systems that render employees green for the benefit of individuals, society, the natural environment, and the business (Mishra, 2017). It is also defined as the practices and policies related to human resource management that encourage the sustainable use of resources and the realization of a sound environment, and that serve to increase satisfaction and consequently the morale of employees within organizations (Obaid, 2015).

The Importance of Green Human Resource Management

Bon et al. (2018) outlined the importance of green human resource management as follows (Hussein, 2022):

- It helps organizations achieve financial savings and, consequently, better profits.
- It draws on natural systems and provides a better environment that enables people to enjoy healthier lives.
- It helps increase efficiency and reduce costs among employees without losing talent.
- It contributes to the sustainable use of materials and energy, to recycling, and to improved waste management.

The Objectives of Green Human Resource Management

The principal objectives of green human resource management are as follows (Hosain & Rahman, 2016):

- Preserving the natural environment by reducing waste, recycling, and limiting refuse.
- Providing a healthy work environment to raise efficiency and reduce employee strain while lowering production costs.
- Achieving competitive advantage through green human resource practices and supporting social responsibility.
- Building environmental awareness to develop environmentally friendly behaviors in both the personal and professional life of the employee.
- Encouraging innovation to improve quality and processes, avoiding conflict with environmental protection authorities and complying with their regulations.

Dimensions of Green Human Resource Management Practices

Researchers have identified numerous dimensions of green human resource management practices. This study addresses five dimensions established for green human resource management, as follows.

1- **Green Recruitment**

Recruitment is defined as the process of acquiring new talent possessing knowledge of sustainable processes and of the environmental system that will support effective performance within the organization, in a competition to attract the most creative and innovative employees (Ullah, 2017). The green recruitment process involves the use of environmentally friendly procedures, such as employing technology and the internet in place of paper, which reduces the rate of environmental degradation and improves environmental management systems through clarity of environmental culture and values (Bangwal & Tiwari, 2015).

2- **Green Training and Development**

Jabour et al. (2010) regard training and development as the process of acquiring green intellectual and behavioral skills and of developing strategies that deliver improved activity performance and yield advanced future activities (Jabr, 2021). Green training and development further contributes to enhancing employees' skills and enabling them to deal effectively with environmental issues by equipping them with the knowledge needed to solve work-related environmental problems. It also improves organizations' environmental performance through the use of digital tools such as virtual workshops and online information sharing, thereby reducing pollution and lowering costs (Hussein, 2022).

3- **Green Compensation and Rewards**

Compensation and rewards based on performance constitute a core function of human resource management and represent the optimal and most powerful means of aligning the individual's interests with those of the organization. These practices also support environmental management systems and the development of products and innovations with lower environmental impact (Jabbour & Jabbour, 2015). Rewards and compensation thus become green practices when they are linked to and contribute to supporting positive behaviors beneficial to the environment, preventing negative behaviors harmful to it, and supporting creative initiatives and innovations with green ideas put forward by employees in support of the environment (Masri, 2016).

Green Performance Appraisal

Measuring employees' green performance is one of the core functions of green human resource management practices; without this procedure, no organization can maintain assurance of environmental performance over the long term. The measurement criteria specific to green performance must be consistent with the organization's environmental performance standards (Arulrajah et al., 2015). The effective approach

to implementing green performance management lies in linking it to the green job description, achieved by establishing an environmental information system and conducting periodic reviews, and by defining green objectives and responsibilities at the organizational level. Effective application also entails integrating environmental performance criteria into the general performance appraisal system and into employees' job performance appraisals, with regular feedback provided to improve environmental performance and achieve green objectives (Ullah, 2017).

Environmental Management Systems

Environmental management is defined as the organization's functional structure, linked to the planning, scientific practices, responsibilities, procedures, processes, and development capacities for implementing, accomplishing, reviewing, and following up the environmental policy, with the aim of improving the organization's performance, reducing its adverse environmental impacts, and seeking to prevent those impacts entirely as the principal objective of environmental management (Awad, 2002). The International Organization for Standardization (ISO) defines it as part of an organization's management system used to develop its environmental policies and assess their impact on the environment, helping organizations to meet legal requirements related to the environmental dimension and to identify the environmental activities that achieve economic objectives (Al-Taif & Kourad, 2019).

The environmental management system (EMS) is a subsystem of the larger system (the organization) that serves as an effective tool for maintaining continuity and development through the functions actually granted to it, placing practical application and responsibility toward the organization and society into operation. This management thus appears as a link between the organization and the natural environment in all its contents, accommodating the continued compatibility of the two systems without conflict between them (Al-Azzawi & Al-Naqqar, 2007). The United States Environmental Protection Agency (EPA) defines the environmental management system as a set of processes and activities that enable an organization to reduce its environmental impacts and increase its operational efficiency (Othman, 2008).

The Importance of Environmental Management Systems

Adopting environmental management systems in industrial organizations carries considerable importance for the following reasons (Saad, 2005):

- The existence of a single, designated authority to monitor pollution and protect the environment in industrial organizations, serving as the body responsible for and concerned with all environmental matters within the organization.
- Achieving savings in capital costs and in the operating costs of treatment units.
- The capacity to conduct pollution-control studies while achieving profitability for the industrial organization.
- The capacity to involve specialized external expertise in implementing cleaner production programs.

- Establishing guidelines for general cleanliness and the protection of the internal environment, and better monitoring of environmental quality within the organization.

Types of Environmental Management Systems

Most organizations have come to recognize that addressing environmental issues with a piecemeal outlook satisfies environmental stakeholders only temporarily, in contrast to treatments grounded in a holistic view of environmental management systems. Through the latter, many organizations have moved toward adopting a number of environment-related specifications. Among the most prominent environmental management systems are the British Standard (BS7750), the European specification (EMAS), and the international standard (ISO 14000) (Mishan, 2013).

Requirements of the Environmental Management System According to the International Standard (ISO 14001)

As shown in Figure 2, the environmental management system must be continuously followed up and reviewed in a structured, periodic manner to provide appropriate guidance for environmental practices within the organization, with the aim of responding to changes in internal and external factors. The following is a detailed clarification of these five principles or elements.

1- **Environmental Policy**

This comprises the guiding principles of any organization, aimed at commitment to pollution prevention, compliance with regulations, and continuous improvement (Mahawat et al., 2017).

2- **Planning**

This is a mandatory requirement of the standard. It begins with identifying environmental aspects and integrating them with the determination of the legal requirements with which the organization complies, followed by developing the organization's environmental goals and objectives, so that action programs may be prepared for their implementation as required (Al-Taher & Shaaban, 2021).

3- **Implementation and Operation**

This involves the preparation needed to bring the environmental management system to a stage at which it can be adapted to the requirements of environmental management systems-such as defining the management structure, establishing clear definitions of roles and responsibilities, implementing documented control procedures, and testing emergency response procedures (Sheraz, 2022).

4- **Checking and Corrective Action**

Checking and corrective action is among the core activities of the environmental management system. It involves addressing the environmental aspects and impacts of the organization's situation, monitoring deviation in the implementation of environmental policy objectives, and undertaking corrective action (Allab, 2017).

5- **Management Review**

This is an administrative effort whose purpose is to verify the adequacy of the environmental management system and its components in relation to the organization's environmental objectives and policy, and to contribute to enhancing the organization's competitive capacity through its ability to introduce new improvements arising from the improvement cycle (Mahawat et al., 2017).

Previous Studies

Boulfoul et al. (2025) aimed to analyze the challenges of implementing environmental management systems in Algerian food companies. The findings revealed clear environmental benefits alongside financial and administrative challenges in applying the system.

Abdelhakim (2024) aimed to highlight the importance of green human resource management practices in building an environmentally aware and sustainable work environment. The study also sought to examine the relationships among green human resource management, employee engagement, and environmental outcomes. A review of the literature revealed a strong positive relationship between employee participation and environmental performance: employees concerned with sustainability and environmental protection are more inclined to adopt environmentally friendly behaviors that contribute to protecting the organization's environment. Green human resource management practices were also found to be important in strengthening this relationship.

Zhao et al. (2024) aimed to investigate the role of green human resource management practices in enhancing sustainable performance through organizational ambidexterity and responsible leadership. The study found that GHRM positively affects sustainable performance and strengthens organizational ambidexterity within organizations.

Chaudhary (2020) aimed to analyze the effect of green human resource management practices on employees' environmental behavior. The study found that GHRM significantly influences employees' voluntary and task-related environmental behaviors.

Abu Rumman and Al-Siddiqi (2019) aimed to identify the level of adoption of green human resource management practices at Taif University and to determine the effect of these practices on improving the application of environmental management. The findings showed that green human resource management practices adopted in the green performance appraisal process at Taif University contribute to improving the application of environmental management, whereas the green human resource management practices adopted in green recruitment and green training and development do not contribute to improving the application of environmental management.

Roscoe et al. (2019) investigated the relationship among green human resource management practices, the enablers of green organizational culture, and corporate environmental performance. The study reached several findings, the most important being that green human resource management practices enhance corporate environmental performance and support the development of enablers for green organizational culture.

Roscoe et al. (2019) aimed to examine the relationship among green human resource management practices, green organizational culture, and environmental performance. The findings showed that GHRM contributes positively to improving environmental performance and strengthening green organizational culture.

Saeed et al. (2019) aimed to study the effect of green human resource management practices on employees' environmental behavior. The findings showed that GHRM has a positive and significant effect on employees' environmental behavior in the workplace.

Ikram et al. (2019) aimed to assess the effect of implementing an environmental management system (EMS) on corporate sustainable development. The study found that implementing EMS contributes to improving organizations' environmental, social, and economic performance.

Jayashree and Mohiuddin (2021) aimed to study the effect of cleaner production and environmental management systems on sustainability. The findings indicated that EMS contributes to enhancing environmental sustainability by reducing pollution and improving resource efficiency.

Commentary on Previous Studies and Identification of the Research Gap

The previous studies show clear agreement with the present study in affirming the existence of a positive effect of green human resource management practices and environmental management systems in enhancing environmental performance and achieving sustainable development, as in the studies of Zhao et al. (2024), Roscoe et al. (2019), and Ikram et al. (2019), whose findings demonstrated that these practices contribute to improving environmental performance and organizational environmental behaviors. By contrast, some studies revealed variation in the strength of effect across the dimensions of green human resource management practices, such as the study by Abu Rumman and Al-Siddiqi (2019), indicating that the effect of these practices is not uniform.

The present study is distinguished from previous studies in that it addresses the integration of green human resource management practices and environmental management systems within a single model to measure their combined effect on sustainable development, whereas previous studies have generally focused on each variable separately. It is further distinguished by its application within the cement factory sector in Yemen-a sector that has not received adequate research attention in this context.

Research Problem and Questions

Amer (2013) noted that the threat to Yemen's natural resources is increasing with the proliferation of cement factories established without prior planning or studies and in an unsustainable manner, and that the excessive exploitation of natural resources destroys the local environment and eliminates nature and biodiversity through the various pollutants of cement manufacturing-a state of affairs considered one of the prominent challenges facing environmental concerns in Yemen's cement industry. In

addition, the International Energy Agency (IEA, 2018) classifies the cement industry as one of the most energy-intensive industries globally, which impedes factories' ability to modernize and provide a safe work environment. This deficiency even exacerbates health risks to employees, as cement dust is classified as a carcinogenic and hazardous substance by the Occupational Safety and Health Administration (OSHA, n.d.).

As a result, it becomes difficult for these entities to advance or develop unless they take into account the need to reconcile their economic objectives with environmental requirements, work to develop their strategies, and address the added costs of treating pollution or compensating those harmed-quite apart from the penalties and fines a factory may incur, the reduction in factory productivity that may arise from equipment breakdowns or employee injuries, and the decline in the company's reputation among customers and stakeholders owing to their perception of the pollution and harm it causes to the environment.

In light of the foregoing, the research problem may be framed through the following central question:

What is the effect of green human resource management practices, across their various dimensions (green recruitment, green training and development, green compensation and rewards, green performance appraisal), on environmental management systems in cement factories in Yemen?

The following sub-questions branch from this central question:

- What is the level of application of green human resource management practices in cement factories in Yemen?
- What is the degree of application of environmental management systems in cement factories in Yemen?

Research Objectives

The principal objective of the study is to determine the effect of green human resource management practices on environmental management systems in cement factories in Yemen.

The study further seeks to achieve the following objectives:

- To identify the level of application of green human resource management practices in cement factories in Yemen.
- To determine the degree of application of environmental management systems in cement factories in Yemen.

Research Hypotheses

Drawing on recent literature and the scientific theories encompassed in the study's theoretical framework, together with the findings of relevant previous studies, the study's hypotheses can be grounded in a manner that integrates the theoretical and applied dimensions. The study draws on human relations theory, which emphasizes the role of non-material motivations and a supportive work environment in enhancing employee behavior; general systems theory, which interprets the organization as

an integrated system in which inputs, processes, and outputs interact; and stakeholder theory, which highlights the importance of responding to the expectations of interested parties, including the environmental dimension.

Previous studies support this theoretical orientation, with their findings affirming that green human resource management practices contribute positively to enhancing employees' environmental behavior and improving environmental performance and sustainability (Zhao et al., 2024; Chaudhary, 2020; Saeed et al., 2019). They also showed that the application of environmental management systems is positively reflected in environmental performance despite the implementation challenges that may be encountered (Ikram et al., 2019; Boulfoul et al., 2025), while other studies supported the relationship between green human resource management practices and environmental performance (Roscoe et al., 2019; Abu Rumman & Al-Siddiqi, 2019).

Building on this integration of theoretical foundation and empirical support from previous studies, the study's hypotheses were formulated as null hypotheses to test the effect of green human resource management practices, across their various dimensions, on both environmental management systems and environmental performance within the organization. Accordingly, the study's hypotheses were formulated in null form to test the relationship among the variables as follows.

Main Hypothesis

There is no statistically significant effect at the (0.001) significance level of green human resource management practices, across their dimensions (green recruitment, green training and development, green compensation and rewards, green performance appraisal), on environmental management systems in cement factories in Yemen.

From this, the following sub-hypotheses branch:

- **First sub-hypothesis (H_0a):** There is no statistically significant effect at the (0.001) significance level of green recruitment on environmental management systems in cement factories in Yemen.
- **Second sub-hypothesis (H_0b):** There is no statistically significant effect at the (0.001) significance level of green training on environmental management systems in cement factories in Yemen.
- **Third sub-hypothesis (H_0c):** There is no statistically significant effect at the (0.001) significance level of green compensation and rewards on environmental management systems in cement factories in Yemen.
- **Fourth sub-hypothesis (H_0d):** There is no statistically significant effect at the (0.001) significance level of green performance appraisal on environmental management systems in cement factories in Yemen.

Conceptual Model of the Study

The dimensions of the independent variable (green human resource management practices) were adopted based on the following studies: Chaudhary (2020), Sunita (2017), Chanderjeet (2017), and Haridas and Sivasubramanaian (2016). The dimensions of the dependent variable (environmental management systems) were adopted

from the following studies: EPA (2014), TURCERT (2018), Dawood (2018), Sarode et al. (2016), Whitelaw (2004), and ISO 14001 (1996). Figure 1 illustrates the study model.

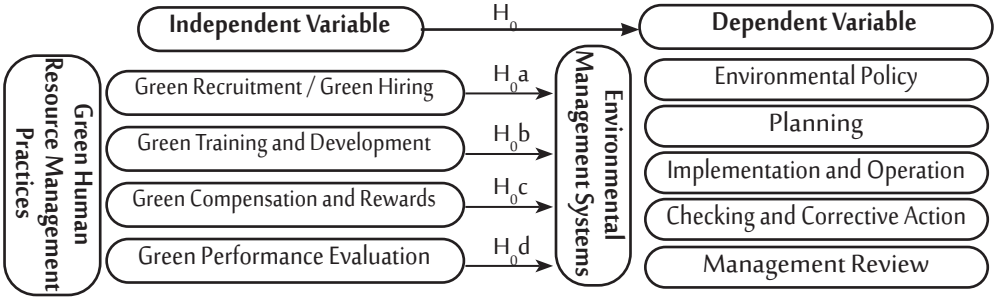

Figure 1: Conceptual Model of the Study

Study Design

The study procedures were organized according to the following methodological design.

Study Methodology

The study adopted the descriptive-analytical approach, given its suitability to the nature and objectives of the study, which lie in analyzing the relationship between green human resource management practices and environmental management systems in cement factories in Yemen. The study also employed inferential statistical analysis to test the hypotheses.

Study Population, Sample, and Sampling Method

The population of the present study comprised all administrative employees at cement factories engaged in all activities related to cement production in Yemen, numbering 1,392. Based on the Krejcie and Morgan (1970) table for determining sample size, the sample size was set at 302 for a population reaching 1,400, at a rate of 22% (Fahmi, 2005).

The study relied on stratified random sampling of administrative employees at the cement factories under study to determine the appropriate sample size for collecting the study data. A total of 305 questionnaires were distributed and 292 were returned, with the number of questionnaires valid for analysis reaching 281, at a rate of 93%. The study also relied on simple random sampling of administrative employees at cement factories in Yemen to determine the appropriate sample size for data collection; Table 1 presents the study population and sample.

Table 1: Study Population and Sample at Cement Factories in Yemen

No.	Factory	Number of administrative employees
1	Bajil Cement Factory	317
2	Amran Cement Factory	479
3	National Company Factory	239
4	Al-Wahda Cement Company	357
	Total	**1,392**

Source: Prepared by the researcher.

Study Measures and Their Characteristics

The study variables were measured using a seven-point Likert scale, which was used to measure the degree of agreement of sample members with the questionnaire items related to green human resource management practices and environmental management systems. The scale items were developed by drawing on relevant previous studies.

Study Data

The study relied on primary data collected in the field through a questionnaire directed to employees at cement factories in Yemen, in addition to secondary data drawn from previous studies and literature relevant to the study topic.

Data Collection Instrument

A questionnaire was used as the primary instrument for data collection. It was designed by drawing on the literature and previous studies that addressed the study variables, in a manner ensuring content validity and suitability to the study population.

Data Collection and Coding Method

Data were collected by distributing a questionnaire to the target sample, then retrieving, reviewing, and verifying its validity for statistical analysis. The data were subsequently coded and entered into the computer after review, in preparation for processing and analysis using appropriate statistical software.

Data Analysis Techniques

Data were analyzed using the SPSS and SmartPLS programs. SPSS was used for descriptive analysis, such as means and standard deviations, while SmartPLS was used to conduct structural equation modeling (SEM), to test the relationships among the study variables, and to test the hypotheses.

Field Study

The study presents the results of analyzing the data extracted from sample members' responses, with the aim of answering the study questions and achieving its objectives. This includes presenting the descriptive results for the study variables, analyzing the relationships among them, and testing the study hypotheses statistically in light of the findings obtained.

Descriptive Analysis of the Variables

The results of the descriptive analysis for the independent variable are presented to answer the first question: What is the level of application of green human resource management practices in cement factories in Yemen? To determine the level of green human resource management practices in the cement factories under study, means, standard deviations, and relative weights were computed for the sample members' responses and arranged in descending order according to the means, as shown in Table 2.

Table 2: Means and Standard Deviations of Respondents' Ratings for the Variable: Green Human Resource Management Practices

No.	Dimension	Rank	Mean	Standard deviation	Percentage	Interpretation
1	Green recruitment	4	4.24	1.49	61%	Moderate
2	Green training	1	4.62	1.50	66%	Somewhat high
3	Green rewards and compensation	3	4.25	1.63	61%	Moderate
4	Green performance appraisal	2	4.26	1.44	61%	Moderate
Green human resource management practices			**4.34**	**1.5**	**62%**	**Moderate**

Source: Prepared by the researcher based on the results of the questionnaire analysis.

Table 2 shows that the overall level of green human resource management practices in the cement factories under study was "moderate," with a mean of 4.34 and a standard deviation of 1.5, reflecting variation in the application of these practices across the factories studied. This points to weakness in awareness, resources, and supporting policies, rendering application unsystematic and limited. At the dimension level, green training ranked first at a "somewhat high" level, with a mean of 4.62 and a standard deviation of 1.50; green performance appraisal ranked second at a "moderate" level, with a mean of 4.26 and a standard deviation of 1.44; green rewards and compensation ranked third at a "moderate" level, with a mean of 4.25 and a standard deviation of 1.63; and green recruitment ranked fourth at a "moderate" level, with a mean of 4.24 and a standard deviation of 1.49.

The results of the descriptive analysis for the dependent variable are presented to answer the second question: What is the degree of application of environmental management systems in cement factories in Yemen? To determine the application of environmental management systems in the cement factories under study, means, standard deviations, and relative weights were computed for the sample members' responses and arranged in descending order according to the means, as shown in Table 3.

Table 3 shows that environmental management systems in the cement factories under study reached a "somewhat high" level, with a mean of 4.52 and a standard deviation of 1.33, indicating the factories' compliance with regulatory, legal, and societal pressures with the aim of improving environmental performance and achieving competitiveness. At the dimension level, implementation and operation ranked first at a "somewhat high" level, with a mean of 4.87 and a standard deviation of 1.47; management review ranked second at a "somewhat high" level, with a mean of 4.54 and a standard deviation of 1.52; the remaining dimensions followed in ascending order, beginning with environmental planning, then checking and corrective action, and finally environmental policy, with a mean of 4.38 and a standard deviation of 1.47.

Table 3: Means and Standard Deviations of Respondents' Ratings for the Variable: Environmental Management Systems

No.	Domain	Rank	Mean	Standard deviation	Percentage	Interpretation
1	Environmental policy	5	4.38	1.47	63%	Moderate
2	Environmental planning	3	4.52	1.40	65%	Somewhat high
3	Implementation and operation	1	4.78	1.47	68%	Somewhat high
4	Checking and corrective action	4	4.39	1.43	63%	Moderate
5	Management review	2	4.54	1.52	65%	Somewhat high
Environmental management systems			**4.52**	**1.33**	**65%**	**Somewhat high**

Hypothesis Testing Results

Results of Testing the Main Hypothesis

This hypothesis states: There is no statistically significant effect at the (0.001) significance level of green human resource management practices, across their dimensions (green recruitment, green training and development, green compensation and rewards, green performance appraisal), on environmental management systems in cement factories in Yemen.

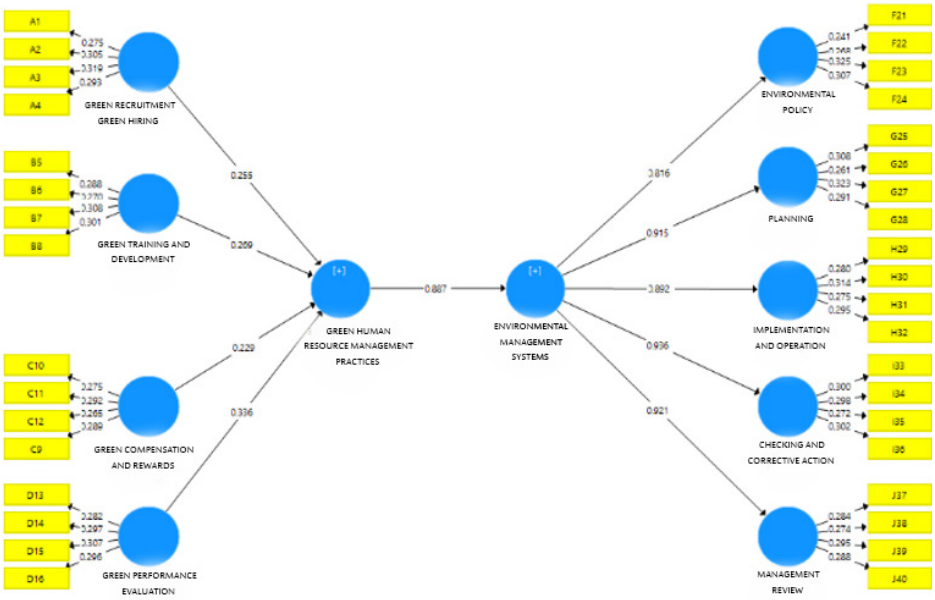

Figure 2: Test of the Simple Linear Regression Coefficient Between Green Human Resource Management Practices and Environmental Management Systems

To test this hypothesis, the researcher used simple linear regression analysis, with the results as follows.

Table 4: Results of the Simple Linear Regression Coefficient Test Between Green Human Resource Management Practices and Environmental Management Systems

Path	Coefficient of determination (R^2)	Beta	Standard error	T	Significance level (Sig)	Decision
Green HRM practices ⟶ Environmental management systems	0.786	0.887	0.013	66.97	0.000	Significant

The results in Table 4 and Figure 2 indicate a strong, positive effect of green human resource management practices on environmental management systems. The regression coefficient (Beta) reached 0.786, indicating a strong positive relationship between the two variables. The coefficient of determination (R^2) showed that green human resource management practices possess high explanatory power, explaining 87.6% of the variance occurring in environmental management systems. The statistical significance of this effect was confirmed by the computed T value of 66.97 at a

significance level of Sig = 0.000; since this value is below the adopted significance level ($\alpha \leq 0.001$), this points to a statistically significant effect of green human resource management practices on environmental management systems.

Based on the foregoing results, the null hypothesis (H_0) is rejected and the alternative hypothesis is accepted, which states: "There is a statistically significant effect at the significance level ($\alpha \leq 0.001$) of green human resource management practices on environmental management systems in cement factories in Yemen."

Testing the Sub-hypotheses of the Main Hypothesis

Table 5: Results of the Simple Linear Regression Coefficient Test Between the Dimensions of Green Human Resource Management Practices and Environmental Management Systems

Path	Coefficient of determination (R^2)	Beta	Standard error	T	Significance level (Sig)	Decision
Green recruitment → Environmental management systems	0.838	0.226	0.012	18.91	0.000	Significant
Green training and development → Environmental management systems	0.795	0.239	0.013	18.28	0.000	Significant
Green compensation and rewards → Environmental management systems	0.666	0.203	0.015	13.20	0.000	Significant
Green performance appraisal → Environmental management systems	0.876	0.298	0.017	17.34	0.000	Significant

The results in Table 5 and Figure 2 indicate the following:

- **A statistically significant effect of green recruitment on environmental management systems.** The regression coefficient (Beta) reached 0.226, a positive value indicating a positive relationship between the two variables. The coefficient of determination (R^2) showed that green recruitment explained 83.8% of the variance occurring in environmental management systems ($R^2 = 0.838$). The statistical significance of this effect was confirmed by the computed T value of 18.91 at a significance level of Sig = 0.000; since this value is below the adopted significance level ($\alpha \leq 0.05$), the effect is confirmed to be substantive and significant. Accordingly, the first null sub-hypothesis is rejected and the alternative hypothesis is accepted.
- **The effect of green training and development on environmental management systems:** A statistically significant effect of green training and development on environmental management systems is evident. The regression coefficient (Beta) reached 0.239. The coefficient of determination (R^2) showed that this dimension explained 79.5% of the variance in environmental management systems ($R^2 = 0.795$). Statistical significance was confirmed by the computed T value of 18.28 at a significance level of Sig = 0.000, which is below the adopted significance level ($\alpha \leq 0.05$), confirming the significance of the effect. Accordingly, the second null sub-hypothesis is rejected and the alternative hypothesis is accepted.
- **The effect of green compensation and rewards on environmental man-**

agement systems: A statistically significant effect of green compensation and rewards on environmental management systems is evident. The regression coefficient (Beta) reached 0.203. The coefficient of determination (R^2) showed that this dimension explained 66.6% of the variance in environmental management systems ($R^2 = 0.666$). Statistical significance was confirmed by the computed T value of 13.20 at a significance level of Sig = 0.000, which is below the adopted significance level ($\alpha \leq 0.05$), confirming the significance of the effect. Accordingly, the third null sub-hypothesis is rejected and the alternative hypothesis is accepted.

- **The effect of green performance appraisal on environmental management systems:** A statistically significant effect of green performance appraisal on environmental management systems is evident. The regression coefficient (Beta) reached 0.298, the highest value among the dimensions. The coefficient of determination (R^2) showed that this dimension explained 87.6% of the variance in environmental management systems ($R^2 = 0.876$). Statistical significance was confirmed by the computed T value of 17.34 at a significance level of Sig = 0.000, which is below the adopted significance level ($\alpha \leq 0.05$), confirming that the effect is substantive and very strong. Accordingly, the fourth null sub-hypothesis is rejected and the alternative hypothesis is accepted.

Study Findings

The study findings revealed the following:

- A strong, statistically significant positive effect of green human resource management practices on environmental management systems in cement factories in Yemen.
- A statistically significant positive effect of all dimensions of green human resource management practices (green recruitment, green training and development, green compensation and rewards, green performance appraisal) on environmental management systems, with variation in the strength of effect.
- Green performance appraisal had the greatest effect on environmental management systems, followed by green training and development, then green recruitment, while the effect of green compensation and rewards was relatively lower.
- The effectiveness of environmental management systems is largely linked to the extent to which green practices are integrated within human resource policies, and not merely to regulatory or technical compliance.
- The study confirms that enhancing employees' environmental awareness and linking individual performance to environmental objectives contribute to improving the sustainability of environmental management systems in cement factories.

Recommendations

Based on the study findings, which seek to strengthen environmental management systems in cement factories in Yemen, the study offers several recommendations summarized as follows:

- Cement factory management should integrate green human resource management practices into the factories' long-term strategies, in a manner that ensures support for environmental management systems and the achievement of environmental sustainability.
- Investing in training and developing employees in environmental practices, emission-reduction techniques, and improving the efficiency of resource use.
- Strengthening the role of human resource management in attracting environmentally aware personnel through the adoption of green recruitment policies.
- Developing performance appraisal systems to include clear and measurable environmental criteria, and linking them to employees' level of environmental commitment.
- Activating green compensation and reward systems to motivate employees to adopt positive environmental behaviors and contribute to improving environmental performance.
- Supporting a culture of environmental work within the factories by disseminating environmental awareness and enhancing employee participation in environmental initiatives.
- Strengthening cooperation with governmental and regulatory bodies to support the application of environmental management systems and compliance with approved environmental standards.
- Adopting the principle of continuous improvement of environmental management systems through periodic review of environmental performance and measurement of progress achieved.

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