Exploring the Potential of Green Human Resource Management for Promoting Environmental Sustainability in The Construction Industry of Developing Countries

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ABSTRACT

The concept of sustainability which has been growing in importance over the past two decades. Sustainability is an important issue being focused upon by industry as well as academic circles (Zuo J., and Jin X, 2012). Green human resource management (GHRM) has emerged as a method to address the challenges that different industrial entities encounter in their pursuit of sustainability. GHRM incorporates sustainable practices into human resource management. This study investigated in detail the prospect of application of GHRM in the construction organizations of developing countries to promote resource conservation and environmental sustainability. Environmental sustainability drivers (ESDs) and GHRM functions were identified through systematic literature review. Major ESDs are centered around the competency and inclination of employees towards environmental management. It was found that there exists a similitude in the GHRM functions and the environmental sustainability drivers (ESDs). Using the Delphi method, GHRM functions and ESDs were linked together. A detailed questionnaire survey was carried out to validate the effectiveness of GHRM application for incorporating environmental sustainability in the construction organizations. The pareto analysis revealed that the functions of GHRM that have the greatest influence on environmental sustainability in the construction industry of developing countries are employee recruitment, training and development, and performance evaluation. This study developed a conceptual framework integrating the GHRM and ESDs to provide basis for developing pro environmental attitude and commitment in the construction practitioners for developing countries. The framework consisted of four GHRM functions combined with eleven ESDs. The

proposed framework can be used as a strategic roadmap to pursue environmental sustainability in construction organizations of developing countries.

Keywords: Green Human Resource Management, Environmental Sustainability, Environmental Sustainability Drivers

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition
GHRM	Green Human Resource Management
HRM	Human Resource Management
ESD	Environmental Sustainability Drivers
SPSS	Statistical Package for the Social Sciences
CRA	Cronbach's Alpha
D^2	Mahalanobis Distance
AEC	Architectural, Engineering and Construction Industry (UK)

CHAPTER 1: INTRODUCTION

The ever-occurring degradation of natural resources has been significantly expedited since the industrial revolution. Energy crises and global warming have emerged as the major challenges faced by countries in contemporary development. Mass consumption of natural resources is deeply rooted in conventional construction industry practices. Construction development influences our effect on the local environment and our combined well-being (Bithas *et al.,* 2006). Over the past years, it has become obvious that construction development has a deteriorating effect on the environment and is predicted to get worse in the future. It is estimated that There will likely be an increase in built-up area of 230 billion m^2 in the upcoming 40 years. (UNEP & IEA, 2018). Sustainable construction has emerged as an enabler to minimize. the detrimental effects of construction industry on the ecosystem. It seeks to develop and uphold harmony between the built and natural environments while considering preservation of natural environment, social well-being, and economic integrity (Oke, A.A. and Aigbavboa, C. M., 2019). Governments, clients, public agencies, and rivals are exerting growing emphasis on construction companies to ameliorate their practices and adopt sustainable construction methods to reduce the harmful effects of construction development on the natural habitat. (Zhang *et al.*, 2019; Mohamad Bohari *et al.*, 2015). Sustainable construction is expected to provide long-term economic, quality, durability, and efficiency benefits (Gholami *et al.*, 2016).

Sustainable construction has faced many challenges in developing countries. According to several researchers, sustainable construction practices are hindered by several impediments. Among these challenges to sustainable construction, the primary barriers are related to employee and public perceptions about construction sustainability. Inadequate

awareness, expertise, and ineffective capacity building among employees are the most common sustainable development impediments. Several factors have been documented as obstacles to sustainable construction adoption, such as reluctance among the staff to embrace the cultural change, inadequate information, and awareness. (Azeem *et al.*, 2017; Ametepey *et al.*, 2015). Bohari *et al.*, (2016), documented that the main impediment to sustainable construction is inadequate awareness among the stakeholders involved in the project. These barriers are centered around employees and the public and possess a considerable impact on the incorporation of sustainable practices in the building and construction sector. The employee-centric challenges emerge from lack of training, resistance to adoption of sustainable practices, absence of specialized knowledge, and a general lack of leadership, motivation and awareness of the sustainable goals (Shi *et al* , 2013; Durdyev *et al.*, 2018).

After the careful examination above, it can be established that most sustainability issues are caused by personnel competency gaps. Most of the challenges noted under employee-centric concerns emerge from a scarcity of skills, knowledge, and understanding in sustainable construction. As a means of pursuing sustainable construction, a unique research paradigm must be adopted that emphasizes the significance of HRM in instilling green abilities and potential among employees.

1.1 Green Human Resource Management

Greening is the procedure of transforming of companies and their operations to be more environmentally responsive, improving resource utilization efficiency, reducing carbon foot-print, and conducting operations using sustainable approach (Francis, C.E. and Ikerd, J.D., 2007). Green human resource management includes the application of human

resource (HR) methods that are environmentally friendly and that lead to improved productivity, lower costs, and improved employee involvement and reservation. GHRM makes the workplace more environmentally sustainable. It encompasses all operations that increase the value of people and the firm. In GHRM various HRM techniques e.g. employee induction, training and capacity building, rewards, performance management, and evaluation are used to provide incorporate a sustainable behavior in the employees of an organization (Rawashdeh, 2021). **Figure 1.1** shows all the functions of GHRM.

GHRM has been essential in accomplishing sustainable objectives across diverse fields, including tourism, hotels, sports, and manufacturing. Dubey (2018) undertook a study to evaluate the effectiveness of green human resource management approaches and procedures in various factories and developed a theoretical framework that enables managers to assess their efforts concerning sustainable goals. Kim *et al.,* (2019) explored the significance of workers' commitment to sustainability and environmental responsibility in the hotel industry. Moreover, Ooi *et al.* (2017) demonstrated the practicability of GHRM solutions in the economic and healthcare sectors to enhance firms' environmental performance while minimizing environmental impact. By blending environmental management with human resource management principles, the concept of GHRM facilitates the creation of human resource management policies that are both environmentally conscious and equally engaging for employees across diverse industries.

Figure 0.1: Green Human Resource Management Functions (Rammasamy *et al.*, 2017)

The application of green human resource management methods to control the environmental sustainability drivers in construction industry shas not been studied before. A detailed investigation into the GHRM concept study could help improve employee commitment and competencies toward sustainable culture in construction sector.

1.2 Objectives

- To identify the contributing factors of environmental sustainability in construction organizations of developing countries.
- To investigate the potential of GHRM in implementing environmental sustainability.
- To develop a conceptual GHRM framework to promote the sustainability culture in construction organizations.

CHAPTER 2: LITERATURE REVIEW

This chapter discusses the contributing factors of environmental sustainability in construction and how they can be implemented using GHRM strategies. Existing literature encompassing environmental sustainability drivers has been reviewed for identifying the specific factors that contribute to environmental sustainability in construction organizations. Furthermore, GHRM functions have been explored in detail. Based on the results of earlier research investigations, a connection between GHRM and environmental sustainability drivers has been established. The research methodology adopted for this study stems from literature review. This chapter integrates all the information required for developing a solid foundation over which the whole study is carried out.

2.1 Environmental Sustainability Drivers in Construction Industry

There are several recognized contributing factors to environmental sustainability in construction. Some of the contributing factors highlight resource efficiency and conservation, energy conservation, education and training of employees, and awareness about sustainable design in clients and employees. **Table 2.1** consists of contributing factors for promoting environmental sustainability in construction which have been identified through previous academic publications.

Table 2.1: Contributing Factors for Environmental Sustainability in Construction

Contributing Factors	References
Energy conservation	Ahn, Y.H. *et al.* (2013), Windapao, A.O. (2014), Durdyev *et al*., (2018), Manoliadis *et al.* (2006), Andelin *et al*. (2015), Tokbolat, S. *et al.* (2019), Liu, J.Y. *et al.* (2012), Yong Han Ahn *et al.* (2015),

Environmental conservation	Ahn, Y.H. et al. (2013), Windapao, A.O. (2014), Tokbolat, S. *et al.* (2019), Adetunji, A. *et al.* (2003), Durdyev *et al.* (2018), Manoliadis *et al.,* (2006), Yong Han Ahn *et al.* (2015),
Waste reduction	Ahn, Y.H *et al.* (2013), Tokbulat, S. *et al.* (2019), Sabiu, M. and Tadesse, N.E. (2020), Durdyev *et al.,* (2018), Manoliadis *et al.* (2006), Ahn, Y.H. *et al.,* (2015)
Water conservation	Ahn, Y.H. *et al.* (2013), Yong Han Ahn *et al.,* (2015)
Increased awareness from clients	Ahn, Y.H. *et al.* (2013), Verma, S. *et al.,* (2020),.Sabiu, and Tadesse, N.E. (2020), Hakkinen and Belloni (2013)
Education and training	Ahn, Y.H *et al.* (2013), Manoliadis *et al.* (2006)
Incentives for green design	Ahn, Y.H. *et al.* (2013), Opoku, D.J. *et al.,* (2019), Manoliadis *et al.* (2006), Hakkinen and Belloni (2013), Liu, J.Y. *et al.*, (2012)
Competitive advantage	Opoku, D.J. *et al.,* (2019), Windapao, A.O. (2014), Adetunji, A. *et al.* (2003), Schmidt, J.S. & Osebold, R. (2017)
Government regulations	Opoku, D.J *et al.* (2019), Ying Li *et al.* (2019), Bamgbade, J.A. *et al.* (2018), Adetunji, A. *et al.* (2003)
Financial benefits	Windapao, A.O. (2014), Mao, Y. and Yang, G. (2012), Adetunji, A. *et al.,* (2003), Liu, J.Y. *et al.* (2012)
Demand by stakeholders	Windapao, A.O. (2014), Ahn,Y.H. *et al.* (2013)
Corporate / Social responsibility	Windapao, A.O. (2014), Opoku, D.J. *et al.* (2019)
Owner's commitment	Aktas and Ozorhon (2015)
Reduced whole life cycle costs	Andelin *et al.,* (2015), Serpell, A. (2013)
Green branding of the company	Andelin *et al.* (2015), Babiak and Trendfilova (2011), Liu, J.Y. *et al.,* (2012), Mao, Y. and Yang, G. (2012), J L Wilson & E Tagaza (2015), Adetunji, A. *et al.* (2003), Mavi, R.K. *et al.* (2020), Opoku, D.J. *et al.* (2019)

New marketing opportunities	Babiak and Trendafilova (2011),Sabiu, M. and Tadesse, N.E. (2020)
Financial incentives by the government	Andelin *et al.*, (2015), Liu, J.Y. *et al.* (2012), Serpell, A. (2013)
Client demands	Andelin *et al.* (2015), Serpell, A. (2013), Sabiu, M. and Tadesse, N.E. (2020), Bamgbade, J.A. *et al.* (2018), Hakkinen and Belloni (2013), Opoku, D.J. *et al.* (2019)
Acquisition of green building certifications	Ahn, Y.H. *et al.* (2013), Verma, S. *et al.* (2020), Yong Han Ahn *et al.* (2015), Mavi, R.K. *et al.* (2020), Andelin *et al.* (2015)
Project team's knowledge and skills	Bamgbade, J.A. *et al.* (2018), Hakkinen and Belloni (2013)
Identification and effective engagement of stakeholders	Bal, M. *et al.* (2013)
Improved health and safety	Sabiu, M. and Tadesse, N.E. (2020), Schmidt, J.S. & Osebold, R. (2017)
Awareness in the general public	Sabiu, M. and Tadesse, N.E. (2020), Mavi, R.K. *et al.* (2020)
Following industrial trend	Adetunji, A. *et al.* (2003), Liu, J.Y. *et al.* (2012)
Product and material innovation	Ahn, Y.H. *et al.* (2013), Yong Han Ahn *et al.* (2015), Manoliadis *et al.* (2006)
Increased productivity through improved processes.	Schmidt, J.S. & Osebold, R. (2017), Ahn, Y.H. *et al.* (2013)

Considering the above discussion, to plan and use sustainable construction techniques, more employee involvement and engagement are required. Employee devotion is believed to be the most significant factor in the success of a company's sustainable endeavors (Rawashdeh, 2021). Hence, it is imperative to focus on the employees' strengths with higher sustainable competencies, and evaluation mechanisms to develop pro environmental behavior in the employees. GHRM strategies can develop pro environmental behavior in employees and can potentially stimulate the identified internal contributing factors for sustainable construction. GHRM strategies are discussed in the following.

2.2 Green Human Resource Management Functions

2.2.1 Green Recruitment and Selection

The conventional focus of an organization's recruiting and selection processes is solely on finding an individual who can effectively carry out the desired tasks on the job and improve performance among a range of applicants. In human resource management, selection entails picking the most suitably qualified candidates from a pool of applicants who meet the necessary criteria, while recruitment refers to requiring several applicants for a specific job opening in a firm. (Rammasamy *et al.,* 2017). To establish a sustainable workplace, it's crucial for a company to hire employees who are well-versed in sustainability practices and show a willingness to support them. GHRM redefines the recruitment and selection process, emphasizing the importance of environmental management within the organization (Deepika, 2016 ; Ahmad, 2015). It is imperative to hire employees whose inclinations align with the environmental protection concept of the company. Employers can instill the idea of environmental preservation throughout their employees' whole career phases by instilling green principles during recruitment (Saeed *et al.*, 2019). Saeed *et al.,*

2019 broke down the three components of green hiring and selection into three categories: green employer branding, green awareness, and green criteria to draw in applicants who are interested in advancing sustainability. Green employer branding means the reputation and image of.an organization related to environmental protection and management, that can be developed using sustainable HRM practices (Jackson *et al.*, 2011).

Green recruitment and selection primarily rely on the level of green awareness among candidates. This includes personality traits that support an organization's environmental objectives, such as agreeableness and consciousness of the environment. Research has shown that employees who comprehend environmental management and its significance can significantly enhance their operational environmental knowledge, which in turn improves their firms' environmental performance (Perron *et al.*, 2006). Therefore, organizations must prioritize hiring employees with green awareness and adopt green evaluation criteria for the selection process. This could involve testing and interviews designed to assess candidates' knowledge of environmental management (Renwick *et al.*, 2013).

2.2.2 Green Training and Development

The process of capacity building of employees and enhancing their skills is a function of HRM which is used to bridge the inequality between the present and the desired performance (Elnaga,.A. A. and Imran, 2013). Training can increase the understanding of environmental operations and bolster employees' competencies (Samalisto and Brorson, 2008). In the context of GHRM, training is the fostering of staff performance, attitudes, and competencies to advance environmental consciousness. The performance of a company as a whole is significantly positively correlated with personnel development and

training (Obaid, T.F., 2015). Employing environmental training strategies can help staff members embrace environmentally conscious paradigm to improve organizational processes. These procedures involve teaching staff to protect the environment, which allows them to develop their skills and sense of self-confidence (Baumgartner & Winter, 2014). For example, as a part of green training and development, the HRM team can educate the employees about new waste reduction and management techniques. The responsibility to train employees lies in the HRM department of any organization. It is therefore imperative for HRM managers to incorporate the green concept in organizational practices to drive environmental management and protection. GHRM is aimed at educating and training employees to facilitate the implementation of sustainability in an organization.

2.2.3 Green Performance Management and Appraisals

The absence of tools for evaluating environmental performance is a significant obstacle to the widespread adoption of sustainable construction practices. The implementation of sustainable construction is hindered by the lack of a measuring system and practical indicators for evaluating environmental performance. This inadequacy results in ineffective monitoring and assessment of green performance (Shi *et al.*, 2013). To manage their performance, different firms conduct regular performance appraisals. It facilitates the alignment of employees' productivity to match the anticipated peak performance of the company. This assessment's primary goal is to close the performance gap between collective employee performance and the desired organizational performance levels. (Odeyale, 2014). GHRM integrates environmental performance into performance management. Green performance management and appraisals are based on the idea of evaluation of employee activities and performance in conjunction with environmental

management (Jabbour, J.C., 2011). Companies must develop a methodical approach for putting sustainable performance management into practice. In order to set an array of green criteria for performance reviews for all employees, including areas like environment protection, clamping down on the carbon-footprint, and communication of environmental issues, green performance management provides green outcome measures. Employee's participation in environmental management emerging from evaluation of their sustainable performance can influence them to take on greater responsibility for environmental cause Establishing clear green goals and motivating staff to take responsibility for environmental management performance are paramount for incorporating sustainability in the organization (Saeed *et al.*, 2019).

2.2.4 Green Compensation and Reward

Using financial and non-financial rewards and compensation employees are provided with incentives to encourage them for their efforts. These incentives are deemed to be quite for aligning the inclinations of the organization and the employees (Ahmad, 2015). Compensation and rewards based on green and sustainable criteria are regarded as significant components in the framework of GHRM and can be utilized to support and promote environmental efforts in a specific organization or corporate unit. A combination of monetary and non-monetary rewards can be utilized in a reward system to inspire employees to strive for the pursuit of an organization's environmental goals. It is also an endeavor to keep the brilliant staff from leaving and to recruit new employees who are familiar with green practices (Gill Mandip, 2012 ; Jabbour *et al.*, 2008). Employees can be encouraged to adopt sustainable behaviors by an organization that develops and maintains incentive systems to incentivize environmental performance, such as the sustainable

performance incentives system, which ties environmental performance with the compensation system. Companies like Allergan and Adobe Systems Ball Cooperation that have embraced sustainable practices are running compensation strategies by associating the issues that can affect the environment with salary (Siyambalapitiya *et.al.*, 2018). Similarly, several other companies have bolstered their sustainability efforts by employing the strategy of rewards for workers who display significant improvement in fulfilling the above-mentioned organizational objective (Ahmad, 2015). Senior managers have the role of providing leadership and motivating other staff to incorporate sustainability into their work activities. Employees' propensity to create eco-initiatives is influenced by environmental reward systems in this regard. Green transportation benefits involve financial aid for commute of workers to and from their respective work sites. Employees can also be aided in lowering their greenhouse gas emissions by providing them free tickets for public transportation services. Several organizations in U.K. have adopted incentive systems and have experienced a significant influence on workers' attitude towards environmental management (Haque, 2017). Sustainability compensation schemes could provide monetary and non-monetary incentives for construction professionals and other staff involved to embrace environmental sustainability in their practice. Incentives and rewards could inspire employees' voluntary pro-environmental behavior. Using green rewards and compensation policies, GHRM assesses voluntary activities outside of job responsibilities to develop self-motivated teams.

2.2.5 Green Employee Involvement and Empowerment

The concept of "Green Employee Involvement and Empowerment" involves actively involving and engaging employees in an organization's efforts to promote environmental

sustainability practices. This involves providing employees with the resources, training, and opportunities to take an active role in sustainability initiatives and promoting their involvement in decision-making related to environmental sustainability. Employee relations are an important part of building a well-natured employer-employee connection in human resource management. Individual employee motivation and morale will improve because of these employee relations and empowerment activities. In GHRM employees are allowed to participate in environmental management activities, that stem from several waste control techniques. Without widespread employee acceptance and collaboration, the effectiveness of environmental policy implementation can be hampered (Renwick *et al.,* 2013). The degree of employee involvement in environmental projects has been found to have a significant correlation with their level of engagement with the organization and its sustainable performance. Additionally, higher levels of employee involvement in environmental projects have been linked to a decreased likelihood of employees resigning from the organization (Benn *et al.,* 2015). GHRM can aid in detecting and addressing workplace issues that could potentially hinder productivity. This approach emphasizes the importance of sustainable practices and their potential benefits for both the environment and employees. By adopting GHRM strategies, organizations can identify and resolve problems that may arise at work while also promoting a greener workplace culture. In detail, positive employee relations are an indescribable and ongoing advantage for every firm. By actively involving employees in green initiatives, construction projects can achieve improved efficiency in resource allocation and usage, as well as reduced waste and pollution. (Shi *et al.,* 2013).

2.2.6 Green Management of Organizational Culture

The concept of Green Management of Organizational Culture pertains to establishing a corporate culture that prioritizes environmental responsibility and accountability. This culture is reflected in the organization's values, norms, and behaviors, which are aligned with the principles of sustainability. Establishing a green organizational culture is accomplished by integrating sustainable practices into all areas of an organization's operations, such as production, logistics, marketing, and human resource management. This involves promoting environmentally friendly processes, reducing waste and pollution, and prioritizing the conservation of natural resources. By incorporating green principles into every aspect of the business, organizations can create a culture that values sustainability and encourages responsible behaviors. This can help them achieve their environmental goals and foster a sense of purpose and commitment among employees. The concept of green organizational culture is relatively new, and there is still some ambiguity surrounding it due to a lack of comprehensive research on the topic. While the idea of promoting sustainable practices in the workplace has gained traction in recent years, there is still much to learn about the best ways to implement and maintain a green organizational culture. As more studies are conducted and insights gained, the understanding of this concept will become clearer and more refined. However, it is termed the set of values which drive a firm’s practices toward becoming a sustainable facility (Afum *et al.*, 2020).

Developing awareness using GHRM practices is not always enough to attain the best green outcomes. Continual evaluation is needed for a company to incorporate the sustainable efforts and strategies into its culture (Mokhtar *et al.*, 2016). GHRM aims to establish a culture that is conducive to pro-environmental behavior. To have a green culture, an

organization must prioritize sustainability beyond profits by adopting eco-friendly practices, reducing waste and pollution, and fostering responsible resource management across all operations. This approach promotes long-term benefits by maximizing organizational value while minimizing environmental impact (Roscoe *et al.*, 2019). A sustainable culture in a firm encompasses common views, values, conventions, and social beliefs regarding sustainability in the workplace, and it influences the expected standard behaviors of employees (Ching-Hsun Chang, 2015). Self-motivated employees can help the organization transform its culture and enhance its processes.

2.3 Summary

This chapter presents a comprehensive literature review that examines the drivers of environmental sustainability and the functions of GHRM. Through this review, the chapter focuses on identifying the key factors that promote sustainability in organizations and the ways in which green HRM can contribute to this effort. By exploring the existing literature on this topic, the chapter provides insights into best practices for integrating environmental sustainability into HRM practices and promoting eco-friendly behaviors among employees. A total of 26 environmental sustainability drivers were identified and their literature score was calculated. The study also identified six green HRM functions and calculated their literature score through content analysis. It aims to provide insights into best practices for promoting sustainability in organizations by integrating environmental principles into HRM practices and fostering eco-friendly behaviors among employees. The identified green HRM functions include green recruitment and selection, green training and development, green performance management, green compensation and rewards, green employee involvement and empowerment, and green management of organizational

culture. These functions represent key areas where organizations can promote environmental sustainability by integrating green principles into HRM practices and creating a culture of eco-friendly behavior among employees. This chapter provides a strong theoretical foundation for the subsequent research to build upon. The literature score determined for ESDs and GHRM functions were used in the later stage of this study for statistical analysis.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter details the methods and steps adopted to achieve the research objectives, which can be broken down into three main phases. The first two phases consisting of literature review and questionnaire survey are based on data collection. While the third part highlights the analysis methods used for interpreting the gathered data. Finally, the development of the GHRM framework is discussed. **Figure 3.1** depicting the research methodology adopted is given below.

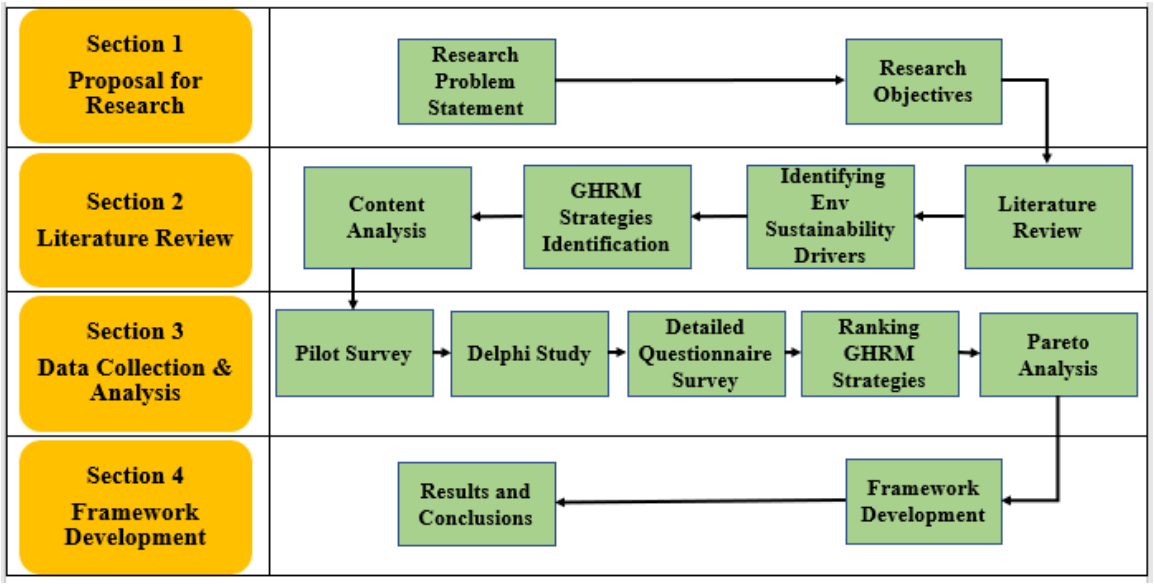

Figure 3.1: Research Methodology Workflow Diagram

3.2 Literature Review

To explore the factors driving the adoption of environmental sustainability practices in construction firms, a comprehensive review of relevant literature was conducted. Through in-depth analysis, various factors were identified and scored based on their frequency of appearance in the literature. A total of 34 impact factor research papers were read and 23

were selected for the identification of potential contributing factors. **Table 2.1** presents a list of 26 factors that were identified as contributing to environmental sustainability, following a thorough review of the selected papers**.** The concept of GHRM was studied in detail. It has been only a decade since the concept of GHRM has been brought into study. The literature introduces the GHRM concept and the different strategies that can be used to apply it in a company to fulfill its environmental management objectives. A literature review was conducted to explore the role of GHRM in promoting sustainable methods across a range of industries, including tourism, hotels, and manufacturing. Through this review, various GHRM strategies described in past research were identified and analyzed. A total of 28 papers were reviewed and among them, 22 were selected for the identification of GHRM strategies. In total, 6 GHRM strategies have been reported collectively in all the reviewed research papers. Content analysis was carried out for the identified GHRM strategies and environmental sustainability drivers to determine their literature score. These strategies are elucidated in Figure 1. Analysis of written, oral or visual data is called content analysis (Cole, 1988). The reviewed literature was considered the primary basis for content analysis.

3.3 Pilot Survey

This research used pilot study initially to facilitate the detailed survey. In order to prepare for a detailed major study, an initial investigation is carried out at a reduced scale that evaluates research methodology, data gathering technologies, sample selection procedures, and other research methods. This process involves conducting a preliminary study to identify and address any potential problems or shortcomings in the research tools and approach before their use in the main study (Lancaster *et al.*, 2004; Kraemer *et al.*, 2006).

Since it is a pre-research preparation to see certain potentials in a particular issue to be carried out independently on a large sample, there is no precise quantity for it. For this study, a sample of 10 respondents was used to assess the response patterns. The responses were analyzed to observe any patterns. Acquiescence bias was observed in the received responses. Acquiescence bias is a category of answering prejudice which commonly occurs in research questionnaire in which the participants are inclined towards opting for a positive connotation disproportionately more frequently.

3.4 Delphi Study

The Delphi study is a methodology adopted for finding the answer or solution to a question. This involves multiple rounds of questionnaires distributed to a targeted group of specialists. Following each round of polling, the experts are provided with a summary of the results, allowing them to modify their answers in light of the group's collective feedback. In this technique, the benefits of expert opinion and elements of collective knowledge are merged. Delphi method was used to categorize the identified drivers of environmental sustainability in the construction organizations. Subsequently, they were classified under different GHRM functions. A group of experts with specific knowledge and experience in the construction industry and project management were chosen to participate in the survey as respondents. The participants included construction practitioners, human resource managers, and academics. The framework for the Delphi study is depicted below in the **Figure 3.2**.

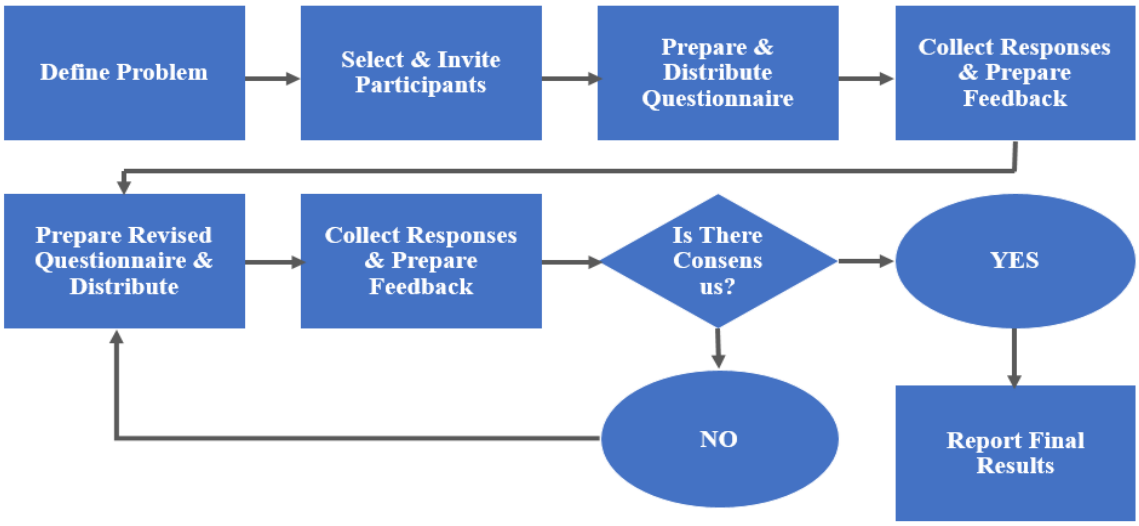

Figure 3.2: Delphi Study Framework

A two-part Delphi study was conducted. In the first part, the identified environmental sustainability drivers were categorized in two categories which are internal, and external contributing factors. Drivers that are internal can be stimulated from within an organization by making policies. While the drivers over which an organization has no control over are external. Organizations cannot influence them. **Table 3.1** presents an illustration of this classification.

Table 3.1: Internal and External Drivers to Environmental Sustainability in Construction

Internal Drivers	External Drivers
Energy conservation	Increased awareness from clients
Environmental conservation	Government regulations
Waste reduction	Demand by stakeholders
Water conservation	Financial incentives by the government
Education and training	Client demands
Incentives for green design	Awareness in the general public
Competitive advantage	Financial benefits
Identification and effective engagement of stakeholders	Following industrial trend

Corporate / Social responsibility
Owner's commitment
Reduced whole life cycle costs
Green branding of company
New marketing opportunities
Enhanced health and safety
Acquisition of green building certifications
Project team's knowledge and skills
Product and material innovation
Increased productivity through improved processes.

External contributing factors to promoting environmental sustainability are created by external parties such as the government, clients, and society. While the internal contributing factors originate from within an organization and can be stimulated based on organizational policies. A total of 26 factors were identified, among which 18 factors are internal to an organization while only 8 external factors were documented. It shows that organizational commitment and participation of employees are paramount to achieving sustainable goals.

During the second phase of the Delphi study, the connections between the internal drivers of environmental sustainability and the functions of GHRM were established. Respondents were asked to classify each driver concerning the GHRM functions listed. Three iterations of this study were done to develop a consensus among the respondents. After substantial agreement of respondents about the classification of all drivers, the Delphi study was terminated because further iterations were not required. The **Table 3.2** depicts the results of Delphi study round two.

Table 3.2: GHRM Functions Linked with Environmental Sustainability Drivers

GHRM Functions	Serial No.	Environmental Sustainability Drivers
Green Recruitment and Selection	F1-1	Competitive advantage
	F1-2	Green branding of company
	F1-3	New marketing opportunities
	F1-4	Acquisition of green building certifications
Green Training and Development	F2-1	Education and training
	F2-2	Improved health and safety
	F2-3	Team's knowledge and skills
Green Performance Management and Appraisals	F3-1	Energy conservation
	F3-2	Waste reduction
	F3-3	Water conservation
	F3-4	Reduced whole life cycle costs
	F3-5	Environmental conservation
Green Compensation and Reward	F4-1	Incentives for green design
	F4-2	Financial benefits
Green Employee Empowerment and Participation	F5-1	Social responsibility
Green Management of Organizational Culture	F6-1	Increased productivity

3.5 Data Collection

Primary data from construction professionals was gathered in the current study through the utilization of a questionnaire survey as a quantitative research approach. One of the most widely used research tools is a questionnaire survey. Questionnaire surveys are commonly

employed in research to collect responses from participants to specific queries. These surveys usually include a combination of closed-ended and open-ended questions. In this study, a questionnaire survey was utilized to investigate the use of GHRM functions in promoting environmental sustainability within construction organizations. The questionnaire survey utilized in this study included closed-ended questions developed with the Likert scale methodology. A five-point Likert scale was used to gauge participants' opinions in response to the survey questions. The questionnaire was designed to determine the extent of agreement of respondents pertaining to efficacy of GHRM strategies to stimulate environmental sustainability drivers. An online survey was created using Google Forms to gather the survey data. In a manner, collecting primary data with an online questionnaire survey is the simplest and fastest method available globally. It allows the researcher to contact respondents who are geographically far away in a shorter span of time (Duthler, 2006). A total of 121 responses were obtained from the online survey.

3.5.1 Profile of Respondents

This survey was conducted online and it was submitted by professionals belonging to developing countries (N=121). The objective of the questionnaire was to gather feedback from individuals employed in the construction industry, academia, project management, and human resources. Apart from collecting data about the GHRM functions and environmental sustainability drivers, respondents were also asked to mention their fields of work, country of work, organization type and level of experience. **Table 3.3** presents the demographic information of the participants.

Table 3.3: Frequency Distribution of Responses

Variables	Frequency	Percentage (%)
Education Level		
Btech / Diploma	7	5.7
Bachelors	73	59.8
Masters	40	32.8
Doctorate	2	1.6
Experience Level		
0 - 3 Years	17	13.9
4 - 6 Years	44	36.1
7 - 9 Years	33	27
10 - 12 Years	15	12.3
13 - 15 Years	9	7.4
16 Years and above	4	3.3
Organization Type		
Client	20	16.4
Consultant	45	36.9
Contractor	32	26.2
Sub-contractor	9	7.4
Specialty Contractor	4	3.3
Supplier	5	4.1
Academia	7	5.7
Field of Work		
Human Resource Management	16	5
Project Management	59	19
Construction Management	45	15
Infrastructure Management	7	3
Architectural	15	5

Building Design	16	5
Quantity Surveying	17	6
Site Execution	54	18
Consultancy	55	18
Contract Management	16	6

3.5.2 Geographical Distribution

This survey collected a total of 122 responses spanning across several developing countries. These responses included 59 national and 62 international responses. The responses were received from countries including Pakistan (59), Azerbaijan (4), Bahrain (2), Dubai (1), India (6), Iran (2), Saudi Arabia (19), Kuwait (6), Malaysia (7), South Africa (3), Sudan (3), Syria (7), Yemen (1), NA (1). A bar chart depicting the geographical distribution of respondents is given below in the **Figure 3.3**.

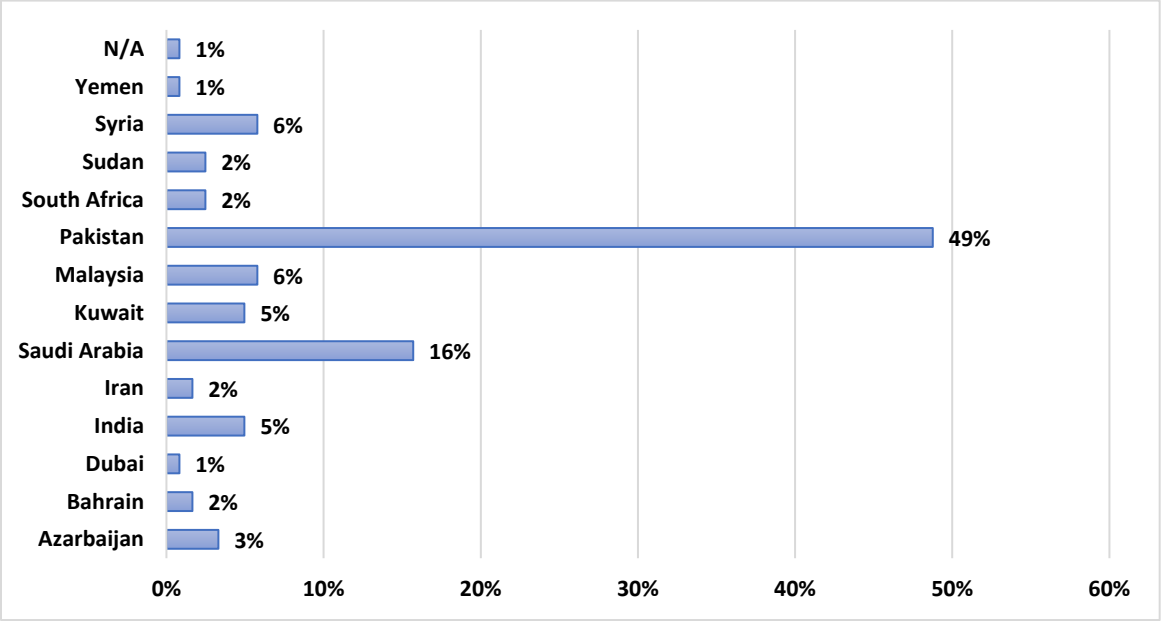

Figure 3.3: Geographical Information of Respondents

3.5.3 Academic Qualification

The respondents of this detailed survey ranged from Btech/Diploma degree holders to Doctorate professionals. Their academic distribution is shown in the **Figure 3.4**.

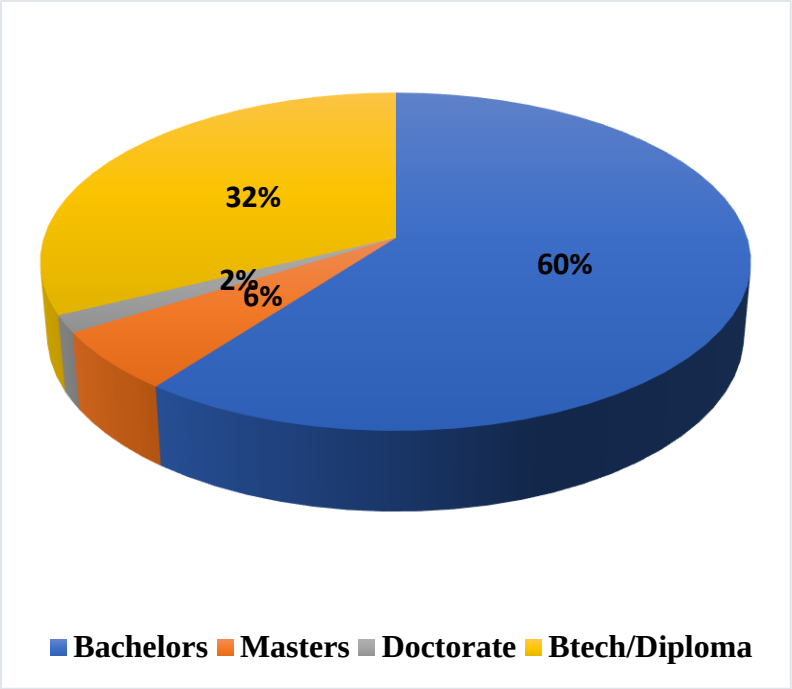

Figure 3.4: Academic Qualification of Respondents

3.5.4 Professional Experience

This questionnaire survey included respondents ranging from beginner level professionals to experienced practitioners of various fields. The responses from the respondents possessing 0 to 3 years of experience were ignored for further analysis. The **Figure 3.5** depicts the professional experience of respondents.

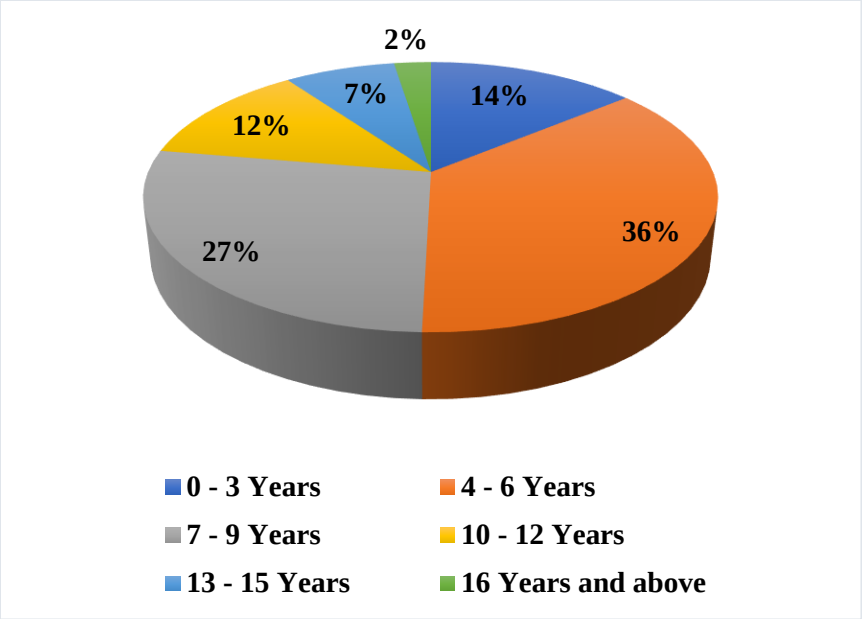

Figure 3.5: Professional Experience of Respondents

3.5.5 Professional Background

Professionals from different fields of engineering and management participated in the detailed questionnaire survey. The included fields and respective number of respondents are elucidated in the **Figure 3.6**.

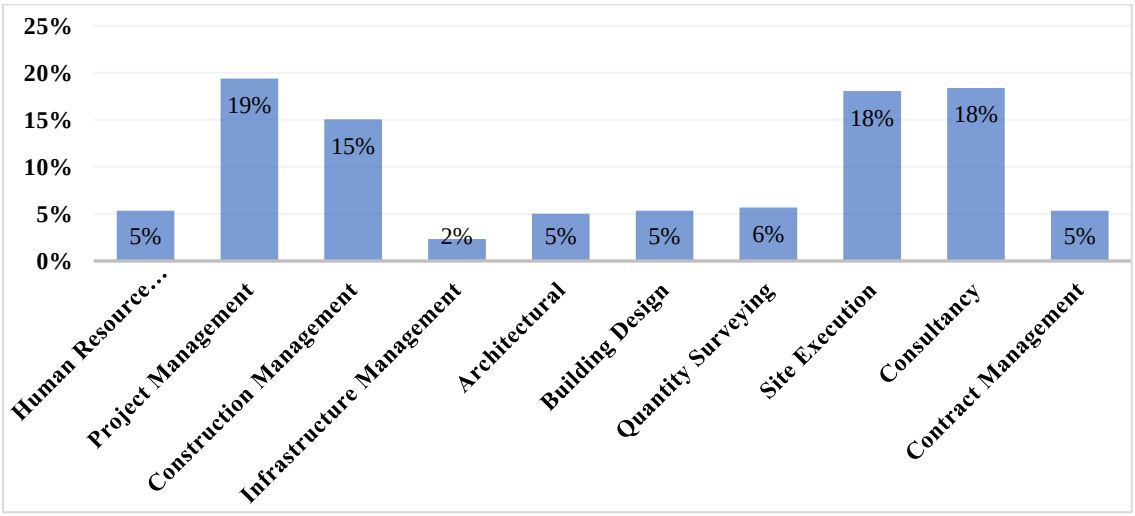

Figure 3.6: Professional Background of Respondents

3.6 Summary

In this chapter, the research methodology utilized for this study was thoroughly discussed. It elaborated on how a literature review, Delphi study, and questionnaire survey were employed to collect and classify pertinent data necessary to attain the objectives of the research. A content analysis of reviewed literature was performed followed by the identification of required GHRM factors and environmental sustainability drivers. Subsequently Delphi study was used to categorize the ESDs as internal or external to an organization. A similitude was observed between the GHRM functions and identified ESDs. Relationships between environmental sustainability drivers and GHRM strategies were established using Delphi study. Finally, a detailed online questionnaire survey was conducted to get an industrial review of the identified factors, their relationships and the application potential of GHRM as a strategy to pursue environmental sustainability.

CHAPTER 4: DATA ANALYSIS & RESULTS

This chapter presents the analysis conducted on the data gathered in the previous chapter and presents the results of the study. Detailed questionnaire was circulated online to professionals belonging to different fields of work including construction, management and academia. In this chapter, the results of detailed questionnaire survey are screened and analyzed. Following data screening and statistical analysis, a conceptual framework was created to aid the integration of environmental sustainability into construction organizations in developing nations.

4.1 Reliability Analysis

Cronbach's alpha is a method to assess the reliability or internal consistency of test items (Cortina, 1993), including those collected on a Likert scale. In this study, the reliability of data obtained from the detailed questionnaire survey was evaluated using Cronbach's alpha, which was computed using SPSS version 26. The resulting value for Cronbach's alpha was 0.921, which is considered excellent in terms of data consistency. **Figure 4.1** shows different value ranges for Cronbach alpha and their consistency level (Gliem & Gliem, 2003).

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Figure 4.1: Cronbach Alpha Value Range and Consistency

4.2 Data Screening

4.2.1 Professional Experience

The initial stage of data screening involved filtering the responses based on the level of experience of the participants. Only the responses from respondents with three or more years of experience were deemed relevant for further analysis, while those with less than three years of experience were excluded. The justification behind this screening was that only an experience of more than three years was considered substantial enough for a meaningful contribution towards data. A total of seventeen such respondents were identified and excluded from further data analysis. The **Table 4.1** shows the responses screened based on experience.

Table 4.1: Screened Responses Based on Experience

Case ID	Experience
6	0 - 3 Years
8	0 - 3 Years
15	0 - 3 Years
34	0 - 3 Years
35	0 - 3 Years
39	0 - 3 Years
41	0 - 3 Years
43	0 - 3 Years
47	0 - 3 Years
62	0 - 3 Years

67	0 - 3 Years
76	0 - 3 Years
83	0 - 3 Years
84	0 - 3 Years
98	0 - 3 Years
109	0 - 3 Years
121	0 - 3 Years

4.2.2 Unengaged Responses

According to Binyamin (2019), when participants consistently choose the same response for most or all survey questions, it may indicate a suspicious response pattern and suggest disengaged responses. This pattern is referred to as straight-lining. To identify such patterns, the standard deviation for each case was computed. Responses with a standard deviation of 0 were excluded, as they signify straight-lining. In this study, four responses were identified as having a straight-line pattern and were excluded from further data analysis. The **Table 4.2** depicts the straight-lined responses.

Table 4.2: Unengaged Responses

Case ID	Minimum Value	Maximum Value	Standard Deviation
27	1	5	0
50	1	5	0
59	1	5	0
80	1	5	0

4.3 Ranking of Environmental Sustainability Drivers

Subsequent data analysis comprised of combining the literature score and the industrial review score of the factors. The academic as well as industrial perspective was considered for an outcome which is integrated into academic and industrial perceptions. Both streams of results were combined using different weightage as follows:

i) 70 / 30 ratio i.e., 70% to industrial review data and 30% weightage to literature review

ii) 60 / 40 ratio i.e., 60% to industrial review data and 40% weightage to literature review

iii) 50 / 50 ratio i.e., 50% to industrial review data and 50% weightage to literature review

iv) 40 / 60 ratio i.e., 40% to industrial review data and 60% weightage to literature review

v) 30 / 70 ratio i.e., 30% to industrial review data and 70% weightage to literature review

For all the options stated above, following scores were calculated using excel sheet formulas.

a. Literature Score

b. Industry Score

c. Normalized Total Score

d. Cumulative Normalize Score

e. Rank

The results of above-mentioned analytics are mentioned in the **Table 4.4** below. The variance between each weightage option can be observed with as the ranks change.

Table 4.3: Industrial and Literature Review Dara

Serial No.	70R/30L Ratio	60R/40L Ratio	50R/50L Ratio	40R/60L Ratio	30R/70L Ratio
F1-1	10	10	9	9	9
F1-2	7	6	4	4	3

F1-4	9	8	7	7	7
F2-1	8	9	10	12	12
F2-2	13	13	13	13	13
F2-3	4	4	5	5	5
F3-1	1	1	1	1	1
F3-2	3	3	3	3	4
F3-3	11	11	11	10	10
F3-4	12	12	12	11	11
F3-5	2	2	2	2	2
F4-1	6	7	8	8	8
F4-2	4	4	5	5	5
F5-1	14	14	14	14	14
F6-1	15	15	15	15	15

The score 60R / 40L was selected for further analysis to adjust the analysis in favor of expert opinion gathered from industrial review. The ranks of factors were determined and further expanded with respect to their relevant GHRM strategy. The **Table 4.5** shows the rank of individual environmental sustainability drivers along with their rank in respective GHRM function.

Table 4.4: Rank of Environmental Sustainability Drivers

Serial No.	**Environmental Sustainability Driver**	**Rank Overall**	**Rank Within Construct**
F1.1	Competitive advantage	10	3
F1.2	Green branding of company	6	1
F1.4	Acquisition of green building certifications	8	2
F2.1	Education and training	9	2

F2.2	Improved health and safety	13	3
F2.3	Team's knowledge and skills	4	1
F3.1	Energy conservation	1	1
F3.2	Waste reduction	3	3
F3.3	Water conservation	11	4
F3.4	Reduced whole life cycle costs	12	5
F3.5	Environmental conservation	2	2
F4.1	Incentives for green design	7	2
F4.2	Financial benefits	4	1
F5.1	Social responsibility	14	1
F6.1	Increased productivity	15	1

4.4 Pareto Analysis

Pareto analysis is based on the premise that certain inputs have a more significant effect on the outcomes of a process than the other inputs. The concept is commonly referred to as the "80/20 rule," which has become a widely used term for a complex economic theory initially proposed by Vilfredo Pareto, an Italian economist in the 19th century (Westcott, 2009). This study used pareto analysis to find the ESDs and GHRM functions possessing the most influence among all the ESDs and GHRM functions that have been identified in this study. The combined score of 60R / 40L was used to rank the ESDs. Based on this score, pareto chart was developed. **Figure 4.2** shows the developed pareto analysis chart for this study. The ESDs possessing the most influence was selected for analysis and conceptual framework development and the rest of ESDs were filtered out. The 80%

influence can be traced to the environmental sustainability driver named “water conservation”. The ESDs before 80% cumulative score have been selected as they possess the 80% of influence on the adoption of environmental sustainability, while the ones after 80% cumulative score have been neglected due to their low level of influence on environmental sustainability adoption. The pareto chart was developed to assess the most influential environmental sustainability drivers which will be subsequently used to develop a conceptual framework.

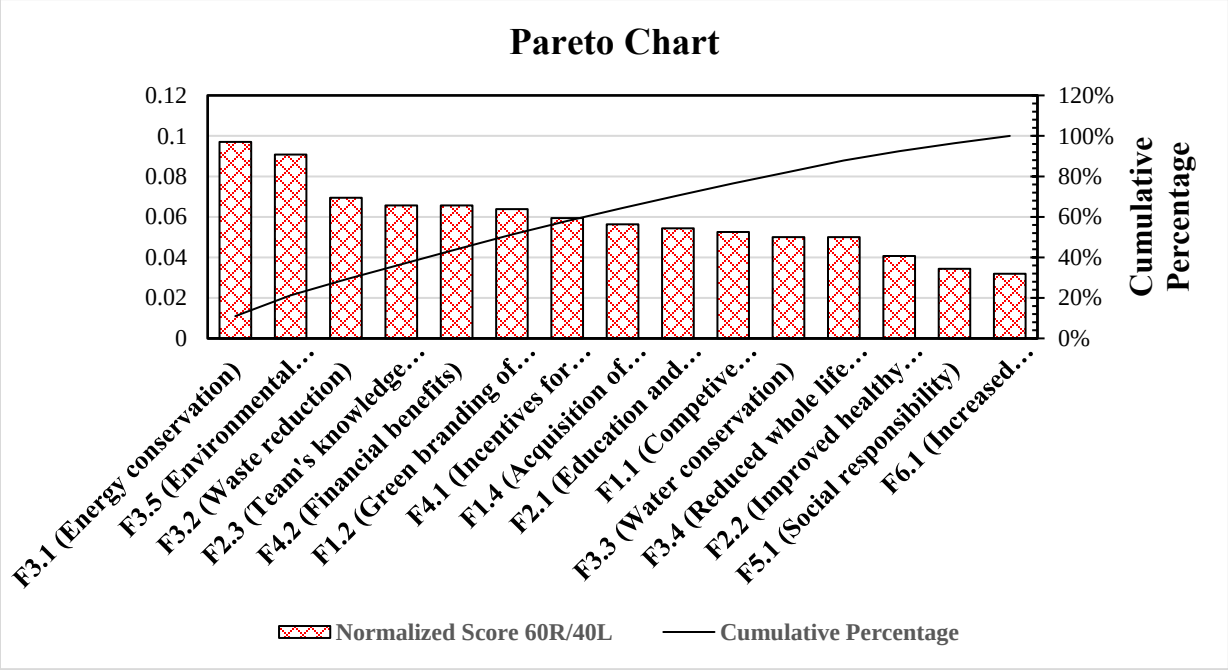

Figure 4.2: Pareto Analysis Chart

A list of ESDs that have been screened through pareto analysis to be most influential is given in the **Table 4.6** below.

Table 4.5: Screened Environmental Sustainability Drivers and GHRM Functions

Green Recruitment & Selection	F1.1 (Competitive advantage)
	F1.2 (Green branding of company)
	F1.4 (Acquisition of green building certifications)
Green Performance Management & Appraisals	F3.1 (Energy conservation)
	F3.2 (Waste reduction)
	F3.3 (Water conservation)
	F3.5 (Environmental conservation)
Green Training & Development	F2.1 (Education and training)
	F2.3 (Team's knowledge and skills)
Green Compensation & Reward	F4.1 (Incentives for green design)
	F4.2 (Financial benefits)

4.5 Framework Development

A conceptual framework is a tool used by researchers to outline how a particular phenomenon develops over time. It helps to establish the theoretical concepts that underpin a research study, providing direction and coherence to the research process. By increasing the generality, acceptability, and significance of research findings, a conceptual framework helps to shape the direction of research and contribute to the growth of knowledge in a particular field. Overall, a conceptual framework is a valuable resource for researchers seeking to gain insight into complex phenomena and generate meaningful insights through their research. In addition, a conceptual framework strengthens the integrity and empirical basis of a study (Adom *et al.*, 2018). his research has developed a framework for the potential application of GHRM in the construction industry of developing countries through a literature survey of environmental sustainability drivers and GHRM functions. The framework emphasizes the crucial role of employees in promoting environmental sustainability and suggests a range of strategies for integrating GHRM practices into the

industry. By drawing on existing research and insights, this framework provides a roadmap for organizations seeking to enhance their environmental sustainability performance while also improving employee engagement and well-being. Ultimately, this research has important implications for the construction industry in developing countries, highlighting the significance of incorporating GHRM techniques to support sustainable development to ensure the long-term viability of the industry. A conceptual framework was developed. **Figure 4.3** shows the conceptual framework developed.

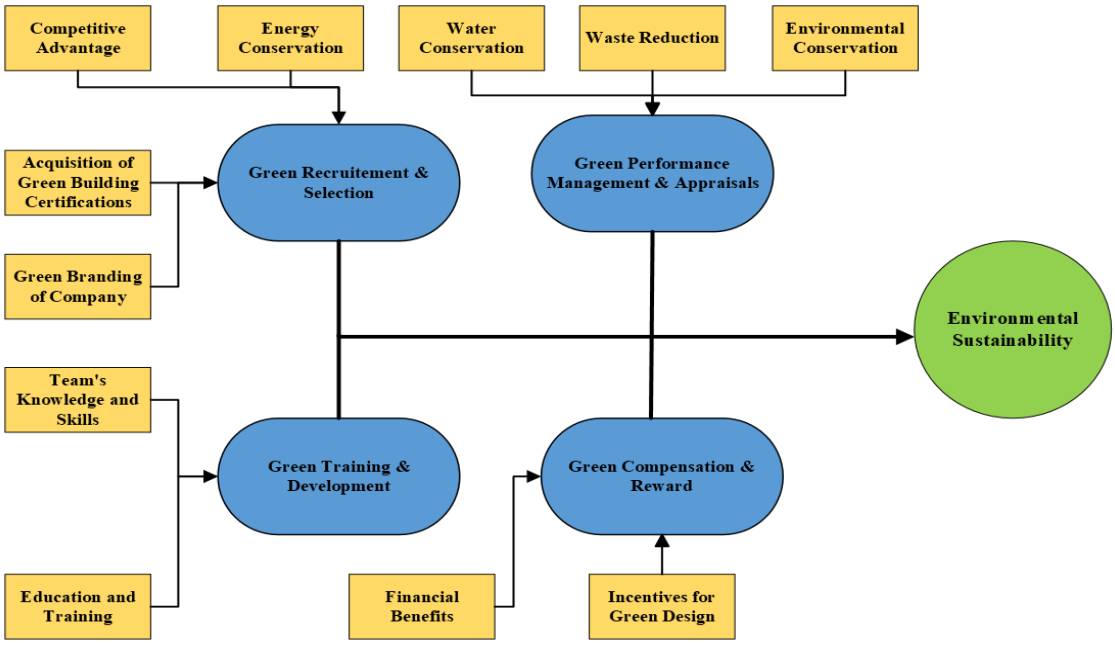

Figure 4.3: Green Human Resource Management Framework for Environmental Sustainability

This model presents the primary functions of GHRM and their corresponding Environmental Sustainability Drivers (ESDs), which can aid in instilling a culture of environmental sustainability in construction organizations of developing nations. The functions are: "Green Recruitment and Selection," "Green Training and Development," "Green Performance Management and Appraisals," and "Green Compensation and

Reward." Based on a review of existing literature and industry practices, two GHRM functions, namely "Green Employee Empowerment and Participation" and "Green Management of Organizational Culture," were excluded as they were found to have limited impact on environmental sustainability.

4.6 Summary

In this chapter, the data was statistically analyzed, and based on the findings, a framework was proposed to utilize GHRM as a means to integrate environmental sustainability management. The responses obtained from detailed questionnaire survey conducted online were screened and analyzed for narrowing down to the most significant ESDs and GHRM functions. Industrial review score of the ESDs obtained from online questionnaire survey was combined with literature score with a ratio of 60% industrial score and 40% literature score. The final score was used to rank all the ESDs. Subsequently, pareto analysis was conducted and the ESDs possessing the most influence over the environmental sustainability adoption were selected. Out of the various GHRM functions examined, it was determined that green recruitment and selection, green training and development, green performance management and appraisals, and green compensation and rewards had the greatest impact in terms of fostering sustainability adoption. Based on the results of pareto analysis, a framework was developed linking the GHRM functions with ESDs. This framework can be used to strategically implement environmental sustainability plan in a construction organization.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This chapter encompasses the outcomes of the study, its constraints, and suggestions for future research based on the results. It explains the fulfillment of objectives that were set up in the start of this study. It summarizes the entire research study and focuses on the results obtained.

5.1 Review of Objectives

The primary objective of this study was to explore the use of GHRM as a strategy to promote the implementation of environmental sustainability in construction organizations of developing nations worldwide. In view of the data analysis, the objectives of this study are restated below for review.

- To identify the contributing factors of environmental sustainability in construction organizations of developing countries.
- To investigate the potential of GHRM in implementing environmental sustainability.
- To develop a conceptual GHRM framework to promote the sustainability culture in construction organizations.

To evaluate the feasibility of GHRM approaches in integrating environmental sustainability in construction organizations of developing nations, this study obtained data from both academic literature and industry sources. Major environmental sustainability drivers were identified and were linked with GHRM strategies through expert opinion. Lastly, a framework based on the data analysis for providing construction companies with

a roadmap to instill environmental sustainability among their employees.

5.2 Conclusions

- In striving for environmental sustainability, Human Resource Management assumes a pivotal role, and hence, any construction organization aspiring to become environmentally sustainable must consider this aspect.
- Most drivers of environmental sustainability in the construction organizations are internal to an organization and can be controlled from within. These drivers are primarily centered around the skills, knowledge and inclination of employees towards environmental management.
- Green Human Resource Management emphasizes the involvement of employees in achieving an organization's sustainable objectives. There exists a similitude between the major environmental sustainability drivers and GHRM practices.
- By combining Green Human Resource Management with a concentration on environmental sustainability drivers, effective strategies can be devised to advance environmental management objectives. In this way, GHRM can prove to be instrumental in adopting environmental sustainability in the construction organizations of developing countries.
- From the literature review, six GHRM functions have been identified. However only four GHRM functions including Green Recruitment and Selection, Green Training and Development, Green Performance Management and Appraisals, and Green Compensation and Reward can be regarded as the most useful for adopting sustainable culture in construction organizations.
- Out of all the GHRM functions, Green Performance Management and Appraisals is the

most potent and impactful approach for promoting environmental sustainability adoption.

- The developed framework which combines GHRM functions and ESDs can be used to take pragmatic steps towards incorporating environmental sustainability and management in the construction organization of developing countries.

This research focused on the role of employees towards environmental sustainability incorporation. As per the findings, employees wield significant influence in propelling environmental sustainability in the construction industry. Given that they execute the daily tasks in construction projects, they can function as a catalyst for implementing eco-friendly practices. Furthermore, construction organizations should offer their employees ample opportunities for training and development, enabling them to acquire the requisite skills and knowledge for carrying out their responsibilities in an environmentally-responsible manner. Moreover, performance evaluations should include environmental sustainability metrics to incentivize employees to promote environmental sustainability actively.

5.3 Discussion

This study underscores the significance of introducing environmental sustainability practices in the construction industry of developing nations and suggests GHRM as a potential solution. The framework formulated in this research can serve as a roadmap for organizations seeking to implement GHRM practices and prioritize the most effective strategies for promoting environmental sustainability. By empowering their employees and fostering a culture of sustainability, organizations can contribute to a more environmentally sustainable future for the construction industry and the planet at large. Several previous studies have examined the adoption of sustainability in the construction sector, with many analyzing environmental sustainability drivers and devising strategies to implement

environmental sustainability. The concept of GHRM is introduced in this study, along with a proposal to integrate it with environmental sustainability drivers to aid the integration of environmental sustainability. The utility of this study is that it presents pragmatic steps that can be taken collectively or individually to ensure sustainable culture in construction organizations. It highlights the importance of HRM for the influencing the behavior of employees in construction organizations.

5.4 Recommendations for Future Research

Here are some future research recommendations based on the findings of this study:

- Case studies can be conducted to validate the effectiveness of the proposed GHRM framework in promoting environmental sustainability in the construction sector of developing nations.
- Explore the potential of GHRM in promoting social sustainability, such as improving the quality of life of employees, promoting social equity, and enhancing community engagement in the construction sector of developing countries.
- Investigate the potential economic benefits of GHRM in the construction industry of developing countries, such as cost savings from energy and resource efficiency.
- Evaluate the potential barriers to the adoption of GHRM in the construction industry of developing countries and develop strategies to overcome these barriers.
- Investigate the role of stakeholders, such as governments, NGOs, and trade unions, in promoting GHRM and environmental sustainability in the construction industry of developing countries.

- Conduct comparative studies to investigate the similarities and differences in the application of GHRM for promoting environmental sustainability in the construction sector of developed and developing countries.

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APPENDIX 1

Summary of Previous Studies

Sources	Green Human Resource Management	Construction Industry	Drivers to Sustainable Construction	Drivers Categorization & Link with GHRM	Developing Countries	Framework
Ahn, Y.H. et al. (2013)	✖	✓	✓	✖	✓	✖
Opoku, D.J. et al. (2019)	✖	✓	✓	✖	✖	✖
Susan E. Jackson et al. (2011)	✓	✖	✖	✖	✖	✖
Safa Shaban (2019)	✓	✓	✖	✖	✖	✖
Windapao, A.O. (2014)	✖	✓	✓	✖	✓	✖
Renwick, D. et al. (2012)	✓	✖	✖	✖	✖	✖
Rawashdeh, A.M. (2018)	✓	✖	✖	✖	✓	✖
Tokbolat, S. et al. (2019)	✖	✓	✓	✖	✖	✖
Azeem et al. (2017)	✖	✓	✓	✖	✖	✓
Ramasamy, A. et al. (2017)	✓	✖	✖	✖	✓	✓
Darvazeh, S.S. et al. (2022)	✓	✓	✖	✖	✓	✖
Current Study	✓	✓	✓	✓	✓	✓

APPENDIX 2

Pilot Study

Exploring the Potential of Green Human Resource Management for Promoting Environmental Sustainability in The Construction Industry of Developing Countries

Greetings,
I am Muhammad Zubair, a student of Master's in Construction Engineering and Management at NUST Islamabad. This questionnaire survey is a part of my MS research titled "Exploring the Potential of Green Human Resource Management for Promoting Environmental Sustainability in The Construction Industry of Developing Countries". This survey aims to investigate the effectiveness of GHRM (Green Human Resource Management) to promote the adoption of environmentally sustainable practices in construction firms.
Your contribution in this regard will be highly appreciated. You may contact me at the email mentioned below. Thanking you in anticipation.

Regards,
Muhammad Zubair
Department of Construction Engineering and Management,
National University of Science and Technology NUST, Islamabad, Pakistan.
Email: zubairawan997@gmail.com

zubairawan997@gmail.com (not shared) Switch account

* Required

Full Name *

Your answer

Gender *

Your answer

Please select your highest academic qualification. *

- ◯ Bachelors
- ◯ Masters
- ◯ Doctorate

Please indicate your professional experience in years. *

- ◯ 0 to 5 years
- ◯ 6 to 10 years
- ◯ 11 to 15 years
- ◯ More than 15 years

Please indicate your organization type *

- ◯ Client
- ◯ Consultant
- ◯ Sub-contractor
- ◯ Specialty Contractor
- ◯ Supplier
- ◯ Academic Instituite

Effectiveness of GHRM Functions for Promoting Environmental Sustainablity In Construction Firms

Green Human Resource Management (GHRM) is the implementation of environmentally friendly Human Resource Strategies to achieve increased efficiency, cheaper costs, and improved employee engagement and retention. Its functions are stated below:

1. Green Recruitment and Selection:
It is the hiring of candidates based on their awareness related to the environmental management.

2. Green Training and Development:
It is the organizational development of behaviors, attitudes, and skills among the employees to promote environmental consciousness

3. Green Performance Management and Appraisals:
It is the performance management of employees based on environmental goals of an organization.

4. Green Compensation and Reward:
This function uses financial and non-financial incentives to motivate employees to work towards the organization's environmental goals.

5. Employee Involvement and Empowerment:
It involves empowering employees to enhance their participation in environmental management activities.

6. Green Management of Organizational Culture:
It involves setting up principles and values in the organization that are conducive to pro environmental behavior.

1. Green Recruitment and Selection: Evaluating the candidates on green criteria e.g., environmental knowledge and environmental management skills, when hiring can promote environmental sustainability in a construction organization. *

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

2. Green Training and Development: Educating employees about environmental management and training them on methods to conserve energy, recycle, and reduce wastage can promote environmental sustainability in a construction organization. *

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

3. Green Performance Management and Appraisals: Evaluating employees based on green performance indicators i.e., their carbon footprint, and energy use, can promote environmental sustainability in a construction organization. *

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

4. Green Compensation and Reward: Using financial and non-financial incentives to motivate employees to work towards the organization's environmental goals can promote environmental sustainability. *

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

5. Employee Involvement and Empowerment: Engaging employees in green initiatives can promote environmental sustainability in a construction organization. *

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

6. Green Management of Organizational Culture: Adopting policies to transform organizational culture can promote environmental sustainability in a construction organization. *

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

APPENDIX 3

Profile of Delphi Study Respondents

Name	Qualifications	Experience (Years)	Job Title
Samab Ali Ahmad	MS Project Management	15+	CEO
Zaheer Ahmed	MS Project Management	15+	HR Manager
Muhammad Yusuf	BS Civil Engineering	13	Project Manager
Huzaifa Bilal	BS Civil Engineering	10	Senior Project Engineer
Mudassir Munir Shah	MS Geotech Engineering	8	Chief Estimation Engineer
Zulqernain Haider	BS Civil Engineering	7	Supervisor
Faseeh Uddin Muhammad Nasir	MBA	7	Lecturer
Khwaja Ahsan Khursheed	MS Structural Engineering	6	Sub Divisional Officer
Sabein Irshad	BS Mechanical Engineering	6	Assistant Manager
Abrar Ahmed	MS Water Resource Management	5	QC Manager

Delphi Study Phase 1.0

Exploring the Potential of Green Human Resource Management for Promoting Environmental Sustainability in The Construction Industry of Developing Countries

Greetings,
I am Muhammad Zubair, a student of Master's in Construction Engineering and Management at NUST Islamabad. This Deplhi study questionnaire is a part of my MS research titled "Exploring the Potential of Green Human Resource Management for Promoting Environmental Sustainability in The Construction Industry of Developing Countries".

This is the first round of Delphi study. It lists Drivers of Environmental Sustainability in construction organizations. It aims to categorize the selected drivers for environmental sustainability into two categories i.e. internal and external drivers.

Your contribution in this regard will be highly appreciated. You may contact me at the email mentioned below. Thanking you in anticipation.

Regards,
Muhammad Zubair
Department of Construction Engineering and Management,
National University of Science and Technology NUST, Islamabad, Pakistan.
Email: zubairawan997@gmail.com

Please state your full name *

Your answer

Please select your highest academic qualification. *

- ○ Bachelors
- ○ Masters
- ○ Doctorate

Please indicate your professional experience in years. *

- ○ 0 to 3 years
- ○ 4 to 6 years
- ○ 7 to 9 years
- ○ 10 to 12 years
- ○ 13 to 15 years
- ○ 16 years and above

Please indicate your organization type *

- ○ Client
- ○ Consultant
- ○ Contractor
- ○ Sub-contractor
- ○ Speciality Contractor
- ○ Supplier
- ○ Academic Instituite

Please indicate your field of work (Select all that may apply) *

- ☐ Human Resource Management
- ☐ Project Management
- ☐ Construction Management
- ☐ Infrastructure Management
- ☐ Architectural
- ☐ Building Design
- ☐ Quantity Surveying
- ☐ Site Execution
- ☐ Consultancy
- ☐ Contract Management

Categorization of Environmental Sustainability Drivers

Internal Drivers: Drivers that can be stimulated from within an organization by making policies.

External Drivers : Drivers on which an organization has no control over. Organizations cannot influence them.

Kindly categorize the environmental sustainability drivers as either 'Internal' or 'External' based on the definition provided above.

	Internal Driver	External Driver
Energy conservation	○	○
Environmental conservation	○	○
Waste reduction	○	○
Water conservation	○	○
Increased awareness from clients	○	○
Education and training	○	○
Incentives for green design	○	○
Competitive advantage	○	○

Government building regulations	○	○
Financial benefits	○	○
Demand by stakeholders	○	○
Corporate / Social responsibility	○	○
Owner's commitment	○	○
Reduced whole life cycle costs	○	○
Green branding of company	○	○
New marketing opportunities	○	○
Financial incentives by the government	○	○
Client demands	○	○
Acquisition of green building certifications	○	○
Project team's knowledge and skills	○	○
Identification and effective engagement of stakeholders	○	○

Improved health and safety	○	○
Awareness in general public	○	○
Following industrial trend	○	○
Product and material innovation	○	○
Increased productivity through improved processes.	○	○

Delphi Study Phase 2.0

Linking Environmental Sustainability Drivers with GHRM Functions

Greetings,
I am Muhammad Zubair, a student of Master's in Construction Engineering and Management at NUST Islamabad. This Deplhi study questionnaire is a part of my MS research titled "Exploring the Potential of Green Human Resource Management for Promoting Environmental Sustainability in The Construction Industry of Developing Countries".

This is the first round of Delphi study. It lists Drivers of Environmental Sustainability in construction organizations and aims to link the drivers for environmental sustainability with the Green Human Resource Management (GHRM) functions.

Green Human Resource Management (GHRM) is the implementation of environmentally friendly Human Resource Management Strategies to achieve increased efficiency, cheaper costs, and improved employee engagement and retention. Its functions are stated below:

1. Green Recruitment and Selection
2. Green Training and Development
3. Green Performance Management and Appraisals
4. Green Compensation and Reward
5. Employee Involvement and Empowerment
6. Green Management of Organizational Culture

Your contribution in this regard will be highly appreciated. You may contact me at the email mentioned below. Thanking you in anticipation.

Regards,
Muhammad Zubair
Department of Construction Engineering and Management,
National University of Science and Technology NUST, Islamabad, Pakistan.
Email: zubairawan997@gmail.com

Green Human Resource Management Functions

GHRM (Green Human Resource Management) functions and their details are listed below.

1. Green Recruitment and Selection:
It is the hiring of candidates based on green criteria e.g., environmental knowledge and environmental management skills and maintaining a green reputation of the organization.

2. Green Training and Development:
It is the organizational development of behaviors, attitudes, and skills among the employees to promote environmental consciousness. It includes educating employees about environmental management and training them on methods to conserve energy, recycle, and reduce wastage.

3. Green Performance Management and Appraisals:
It is the performance management of employees based on the environmental goals of an organization. It includes evaluating employees based on green performance indicators i.e., their carbon footprint, and energy use.

4. Green Compensation and Reward:
This function uses financial and non-financial incentives to motivate employees to work towards the organization's environmental goals.

5. Employee Involvement and Empowerment:
It involves empowering employees to enhance their participation in environmental management activities.

6. Green Management of Organizational Culture:
It involves setting up principles and values in the organization that are conducive to pro environmental behavior.

	Green Recruitment and Selection	Green Training and Development	Green Performance Management and Appraisals	Green Compensation and Reward	Employee Involvement and Empowerment
Energy conservation	○	○	○	○	○
Environmental conservation	○	○	○	○	○
Waste reduction	○	○	○	○	○
Water conservation	○	○	○	○	○
Education and training	○	○	○	○	○
Incentives for green design	○	○	○	○	○
Competitive advantage	○	○	○	○	○
Financial benefits	○	○	○	○	○
Owner's commitment	○	○	○	○	○
Corporate / Social responsibility	○	○	○	○	○
Reduced whole life cycle costs	○	○	○	○	○

APPENDIX 4

Detailed Survey

Exploring the Potential of Green Human Resource Management for Promoting Environmental Sustainability in The Construction Industry of Developing Countries

Greetings,
I am Muhammad Zubair, a student of Master's in Construction Engineering and Management at NUST Islamabad. This questionnaire survey is a part of my MS research titled "Exploring the potential of green human resource management for promoting environmental sustainability in the construction industry of developing countries".

Green Human Resource Management (GHRM) is the implementation of environmentally friendly Human Resource Management Strategies to achieve increased efficiency, cheaper costs, and improved employee engagement and retention. Its functions are stated below:

1. Green Recruitment and Selection
2. Green Training and Development
3. Green Performance Management and Appraisals
4. Green Compensation and Reward
5. Green Employee Involvement and Empowerment
6. Green Management of Organizational Culture

This survey aims to investigate the effectiveness of GHRM (Green Human Resource Management) to promote the adoption of environmentally sustainable practices in construction firms. Your contribution in this regard will be highly appreciated. You may contact me at the email mentioned below. Thanking you in anticipation.

Regards,
Muhammad Zubair
Department of Construction Engineering and Management,
National University of Science and Technology NUST, Islamabad, Pakistan.
Email: zubairawan997@gmail.com

Please state your full name *

Your answer

Please select your highest academic qualification. *

- ◯ Bachelors
- ◯ Masters
- ◯ Doctorate
- ◯ BTech / Diploma

Please indicate your professional experience in years. *

- ◯ 0 to 3 years
- ◯ 4 to 6 years
- ◯ 7 to 9 years
- ◯ 10 to 12 years
- ◯ 13 to 15 years
- ◯ 16 years and above

Please indicate your organization type *

- ○ Client
- ○ Consultant
- ○ Contractor
- ○ Sub-contractor
- ○ Speciality Contractor
- ○ Supplier
- ○ Academia

Please indicate your field of work (Select all that may apply) *

- ☐ Human Resource Management
- ☐ Project Management
- ☐ Construction Management
- ☐ Infrastructure Management
- ☐ Architectural
- ☐ Building Design
- ☐ Quantity Surveying
- ☐ Site Execution
- ☐ Consultancy
- ☐ Contract Management

Please mention your the country you are currently working in. *

Your answer

Green Recruitment and Selection

It is the hiring of candidates based on their awareness related to environmental management and maintaining a green reputation of the organization.

Green recruitment and selection of candidates can facilitate the firm in the following ways: *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Evaluating candidates based on green criteria can provide a competitive advantage for a construction company.	○	○	○	○	○
Developing a reputation of environmental protection and management can help in green branding of construction firm.	○	○	○	○	○

Developing a reputation for environmental protection and management can help in creating new marketing opportunities.	○	○	○	○	○
Hiring employees who possess green awareness can help in the acquisition of green building certifications.	○	○	○	○	○

Green Training and Development

It is the organizational development of behaviors, attitudes, and skills among the employees to promote environmental consciousness

Green training and development of employees can have the following effect: *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
It can educate the employees about environmental sustainability.	○	○	○	○	○
It can enhance health and safety in the workplace.	○	○	○	○	○
It can increase the project team's knowledge and skills.	○	○	○	○	○

Green Performance Management and Appraisals

It is the performance management of employees based on the environmental goals of an organization.

Evaluating employee performance based on green criteria (energy usage, carbon footprint, water usage) can help in: *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Enhancing energy conservation.	○	○	○	○	○
Waste reduction	○	○	○	○	○
Water conservation	○	○	○	○	○
Reducing whole life cycle costs	○	○	○	○	○
Enhance environmental conservation.	○	○	○	○	○

Green Compensation and Reward

This function uses financial and non-financial incentives to motivate employees to work towards the organization's environmental goals.

Rewarding employees based on green criteria can: *

	Strongly DIsagree	Disagree	Neutral	Agree	Strongly Agree
Provide incentives for environmental sustainability.	○	○	○	○	○
Provide financial benefits for employees	○	○	○	○	○

Green Employee Empowerment and Participation

It involves empowering employees to enhance their participation in environmental management activities.

Green employee empowerment and participation can: *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Enhance social responsibility.	○	○	○	○	○

Green Management of Organizational Culture

It involves setting up principles and values in the organization that are conducive to pro-environmental behavior.

Green management of organizational culture can: *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Improve productivity of employees	○	○	○	○	○