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RESEARCH PAPER

The Relationship between Green Human Resource Management and Green Supply Chain Management: A systematic review

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ABSTRACT

The incorporation of sustainable practices becomes crucial as firms transition from Industry 4.0 to Industry 5.0. Therefore, this systematic review explores the relationship between the two sustainability approaches; Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) using peer-reviewed studies from 2016-2023, retrieved from Scopus and Web of Science databases. 2016 marks the starting point as the first relevant paper emerged in the literature in that year. The PRISMA approach was used to identify relevant studies, resulting in the inclusion of 30 studies for analysis purposes. The study reveals a growing interest in understanding the relationship between GHRM and GSCM practices and their impact on sustainable performance. The majority of reviewed studies utilized quantitative survey methods, suggesting the need for future research utilizing qualitative and mixed methods for gaining deeper insights. The review indicates that most studies are conducted in emerging countries, and there is a significant gap in research on the relationship between GHRM and GSCM practices in other context. Finally, the study provides valuable insights for practitioners and researchers, emphasising the importance of integrating GHRM and GSCM practices for a sustainable competitive advantage.

KEYWORDS: *Green human resource management; Green supply chain management; Systematic literature review; Sustainable performance; Industry 5.0.*

1. Introduction

With the growing global awareness of the importance of sustainable development, organisations face mounting pressure to embrace practices that promote environmentally responsible operations. In this sense, the incorporation of sustainable practices also becomes crucial as we transition from Industry 4.0 to Industry 5.0 [1]. In response, two areas of strategic focus have emerged as integral components of sustainable business practices; Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM). Both GHRM and GSCM are crucial components of sustainable business practices, each playing a unique role in promoting environmental stewardship. GHRM focusses on integrating environmental considerations into the management of human resources [2], while GSCM focuses on managing the environmental impact of the supply chain [3].

Although both GHRM and GSCM are recognised as critical components of sustainable business practices, there is a notable research gap concerning the intricate relationship between these two domains and their combined impact on organisational performance [4]. The burgeoning interest in each field independently is evident, yet a comprehensive exploration of how GHRM and GSCM interact to influence performance outcomes remains relatively uncharted territory.

Empirical studies have contributed valuable insights, indicating a positive correlation between GHRM and GSCM practices. Noteworthy research by [5], [6], demonstrates the affirmative impact of GHRM practices on GSCM practices. Similarly, [7] highlight the positive influence of GHRM practices, such as green employee

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engagement and a green pay and incentive structure, on green supply chain operations. [8], showed GSCM practices' cumulative effect of GSCM practices on environmental and financial performance, influencing GHRM connections. [9], highlighted the combined GHRM and GSCM on long-term performance in Palestinian manufacturing. [10], demonstrated substantial long-term benefits in Arab nations. Further studies in Thailand [11], Ghana [12], [13], China [14], [15], explored specific dynamics, emphasizing the nuanced impact of regulatory pressure, emotional intelligence, and internal environmental management on GSCM practices and organizational performance.

However, a considerable research gap exists in the literature concerning a holistic examination of the joint implications of GHRM and GSCM for organizational performance [16]. Although individual studies shed light on specific aspects of the relationship, a comprehensive synthesis is notably absent. This gap is particularly evident in the limited number of studies that simultaneously investigate GHRM and GSCM, considering their potential synergies and joint impact on organisational outcomes.

Taking into account the empirical evidence, the primary objective of this study is to provide a comprehensive review of the existing literature on the relationship between Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) and to drive future research in this domain. By summarising and assessing the present body of research, this study aims to expand our knowledge of the link between GHRM and GSCM and their aggregate influence on organisational sustainability.

2. Methodology

The aim of this study was to conduct a systematic review of the current state of research on the link between green human resource management (GHRM) and green supply chain management (GSCM) practices. To conduct a systematic review, the study used the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) approach. The PRISMA approach has been recognised as a useful tool for visualizing the selection process followed during systematic literature reviews, as it promotes transparency, replicability, and precision in research [17]. The PRISMA approach consists of four key phases, which are identification, screening, eligibility, and inclusion. Fig. 1 in the study outlines how these phases were applied in this particular review, and the details of each stage discussed below.

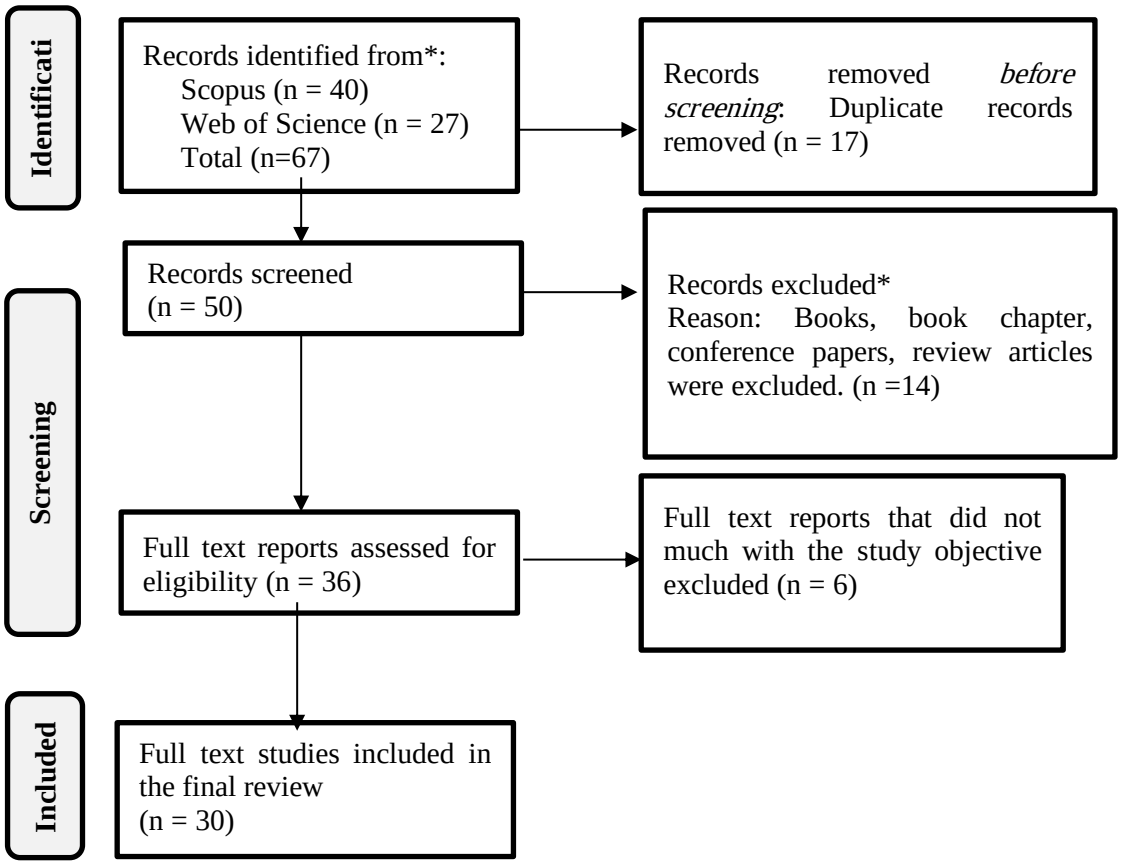

Fig. 1. Article selection process: PRISMA flow diagram [18]

2.1. Identification of the data

This study relies primarily on the Scopus and Web of Science databases as the primary source for searching and locating relevant studies. We chose Scopus and Web of Science, as they are widely used databases that provide access to a vast array of scholarly literature from reputable publishers across various disciplines. In order to ensure the quality and credibility of the studies included in this research, we sourced the articles from some of the most reputable publishers such as Emerald, Elsevier, SAGE Publication, Taylor & Francis, and Wiley Online Library. We chose these publishers because they have a reputation for publishing high quality, peer-reviewed research and are known for their stringent publication standards. By limiting the search to articles generated by these reputable publishers, we ensured that the reviewed literature was of the highest quality, thus providing more robust and reliable results.

For this systematic review, we chose to focus on research published between 2016 and 2023, with the year 2016 serving as the starting point. We selected this year because it marks the development of literature that addresses the link between Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) practices together, and it witnessed a considerable increase in the number of articles that addressed these two concepts combined. Furthermore, it allows us to record the most current and up-to-date information on the subject.

In order to select articles that fit the objective of this study, we established search keywords from previous studies. The keywords were "Green Supply Chain management" OR "Green SCM" OR "GSCM" AND "Green Human Resource Management" OR "Green HRM" OR "GHRM". We used one of the search strategies for these keywords to find studies that consist of these keywords in their title, abstract, and keyword sections. In the preliminary search, we identified 67 articles from both Scopus and Web of Science databases as indicated in.

Tab. 1. Initial search result

Database	Search Keywords	Retrieved Papers
Scopus	"Green Human Resource Management*" OR "Green HRM*" OR "GHRM*" AND "Green Supply Chain Management" OR "Green SCM" OR "GSCM*"	40
Web of Science	TS= ("Green Human Resource Management*" OR "Green HRM*" OR "GHRM*") AND TS= ("Green Supply Chain Management" OR "Green SCM" OR "GSCM*")	27
	Total	67

2.2. Screening of initial data

The search process entailed a preliminary search of two prominent databases, namely Scopus and Web of Science. To ensure the absence of redundancy, all retrieved references were exported to an Excel spreadsheet, where duplicates were identified and removed. Subsequently, the preliminary search results included various publication types of publication, such as conference papers, books, book chapters, and articles. However, the present study restricted its scope to exclusive journal articles, necessitating the exclusion of conference papers, books, book chapters, and other academic dissertations. We considered only publications written in English for inclusion in this review. After completing the elimination process, we removed 17 duplicates and obtained 50 papers. Additionally, we excluded 14 articles that did not meet the inclusion criteria, resulting in 36 articles for subsequent evaluation.

2.3. Determining eligibility and inclusion

In this phase of our systematic review, we established rigorous conditions for the inclusion of relevant literature and refined our search criteria accordingly. We conducted a comprehensive analysis of each remaining article's abstract and full text to assess its suitability for further review, excluding those that did not specifically address the relationship between Green Human Resource Management and Green Supply Chain Management. After undertaking this rigorous screening process, we excluded six (6) articles and ultimately selected 30 articles for inclusion in our systematic literature review.

3. Descriptive Analysis of Aelected Studies

This section provides a comprehensive descriptive analysis of the studies selected in our systematic literature review, including a breakdown of publications by year, distributions of studies

across journals, methodologies employed, context in which the studies were conducted, and co-occurrence of keywords in literature.

3.1. Publications by year

After conducting an extensive literature review, this study found that the first studies exploring the relationship between Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) were published in 2016. Among these studies, an empirical investigation by [16]; and the other is a conceptual paper by [6] were identified. Given that the concepts of GHRM and GSCM are relatively new, few studies examining the relationship between the two. Instead, previous studies have tended to focus on either GHRM or GSCM as independent concepts. Despite the limited number of studies available, there has been a noticeable improvement in the trend of publications over time, as illustrated in Fig. 2.

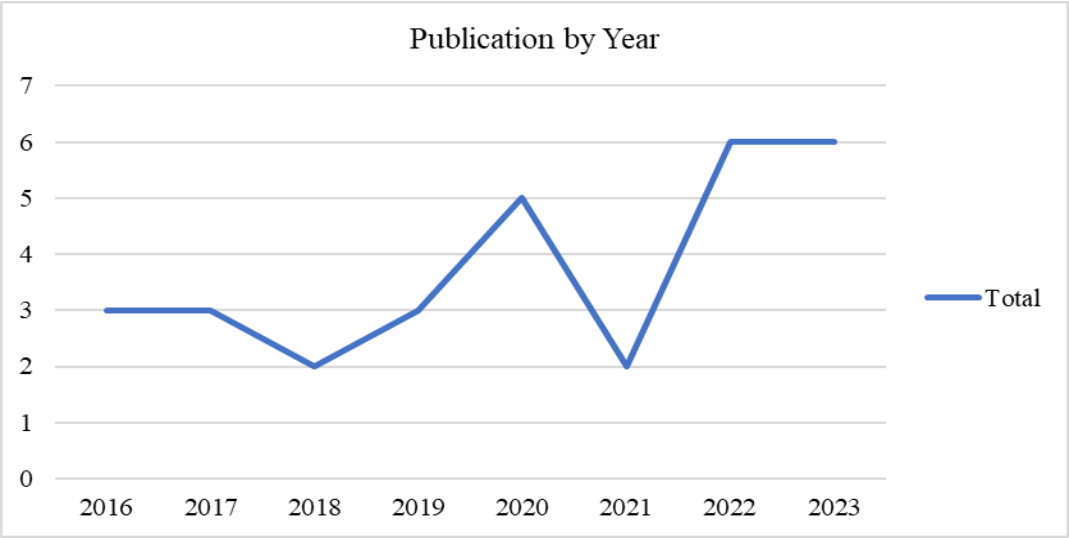

Fig. 2. Articles published per year

3.2. Distribution of articles

An analysis was performed to assess the distribution of articles across different journals, as shown in Fig. 3. The results showed that most of the reviewed articles (16.7% of the total) were published in the Journal of Cleaner Production, with a count of five, the International Journal of Supply Chain Management, Benchmarking, and the International Journal of Production Economics, each with 2 publications, followed this. The remaining 18 articles were spread across various other journals, with each article being published in a distinct journal.

This distribution of articles in different journals indicates the widespread interest and research attention that is paid to the relationship between Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM). It highlights the importance of understanding this relationship in organisational contexts and emphasizes the importance of studying GHRM and GSCM from multiple disciplinary perspectives.

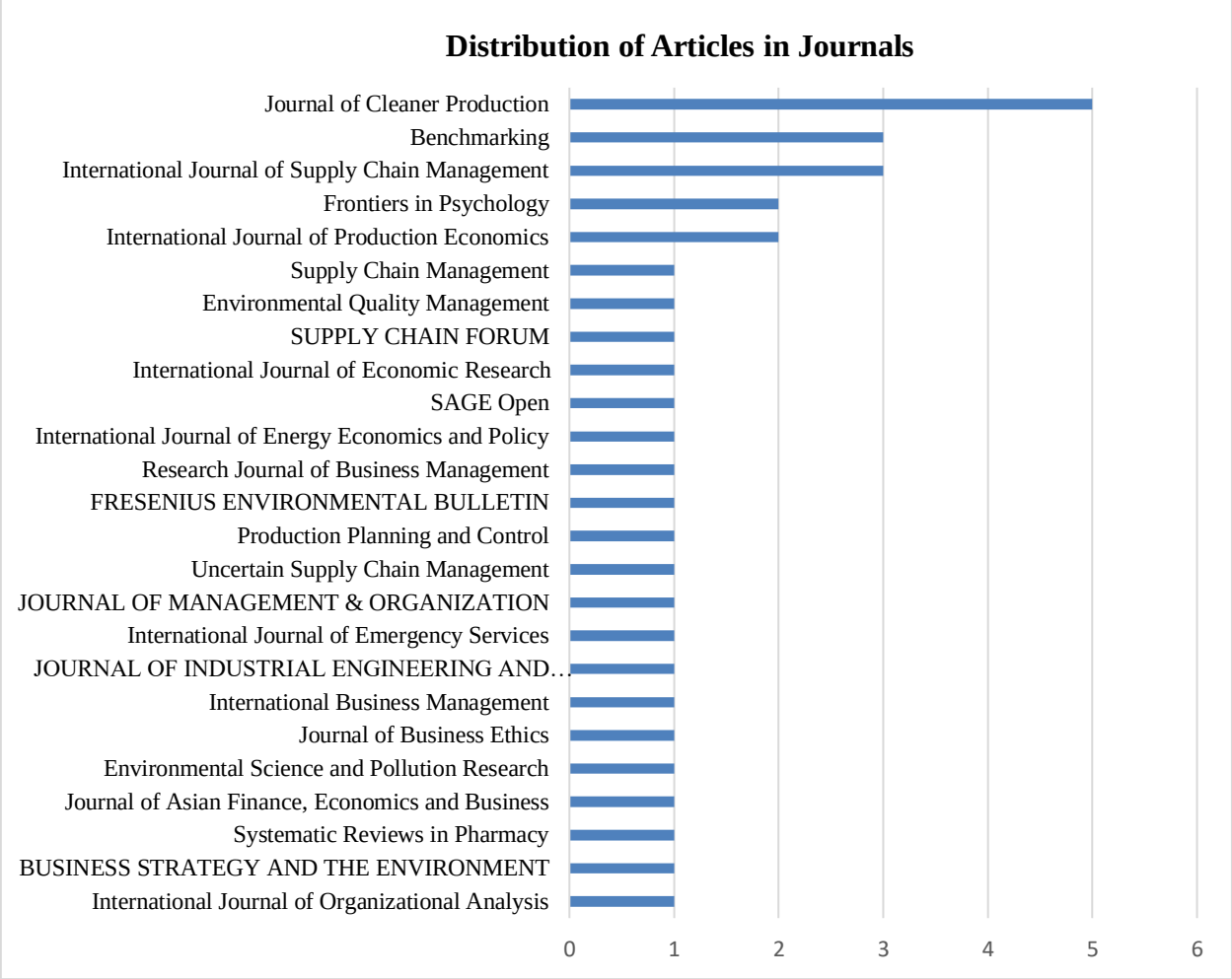

Fig. 3. Articles distribution in journals

3.3. Methodology used in the studies

The findings illustrated in Figure 4 reveal a significant pattern in the research methodologies employed in the examined studies. A substantial majority of 26 of 30 studies opted for a survey-based quantitative approach to examine the causal link between Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM), as well as their combined impact on organisational performance. Particularly, one study embraced a conceptual framework, while another adopted a mixed-method design, and the remaining two studies employed qualitative design.

The scarcity of qualitative or mixed-method studies identified in this review emphasises the prevailing dominance of quantitative research in the field of GHRM and GSCM, as researchers tend to rely on numerical data and statistical analysis to investigate their relationship. However, to gain a deeper and more comprehensive understanding of GHRM and GSCM, it is essential to incorporate qualitative approaches, such as in-depth interviews and case studies.

Therefore, it is highly recommended that future studies adopt a methodologically balanced approach by integrating quantitative, qualitative, and mixed-method research methodologies. This methodological equilibrium will enable researchers to overcome the limitations associated with solely relying on numerical quantification, thereby facilitating a more comprehensive understanding of the relationship between GHRM, GSCM, and organisational performance.

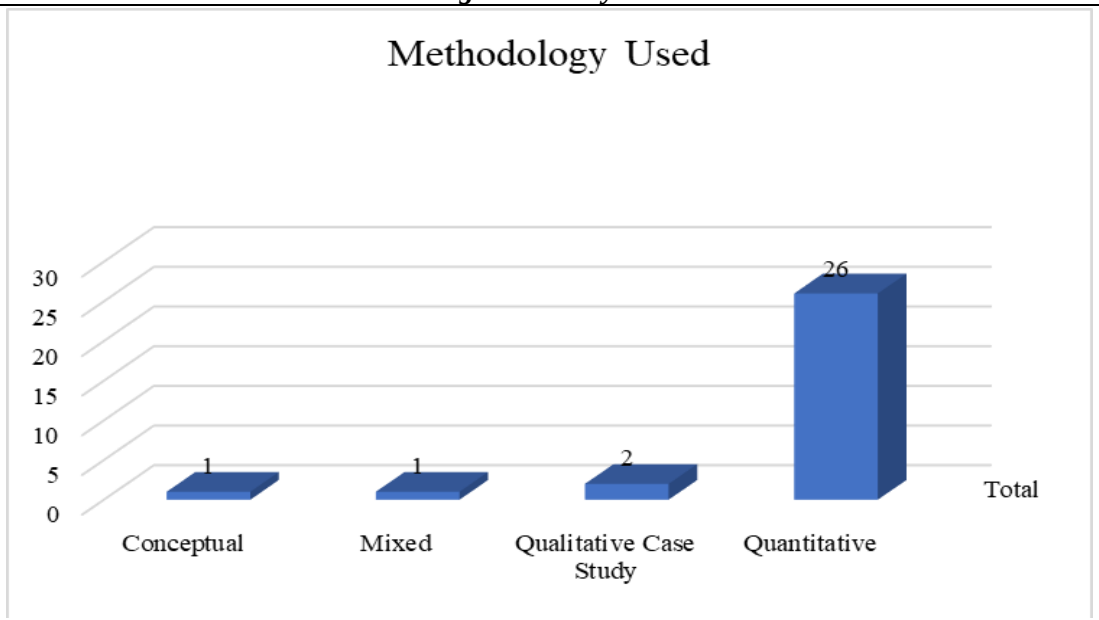

Fig. 4. Methods used

3.4. Studies context

The review process undertaken in this study has revealed a broad geographical distribution of the research on the practices of GHRM and GSCM, which encompasses various countries and cultural contexts, as shown in Fig. 5. Notably, the majority of these studies have been conducted in developing countries, with Pakistan emerging as the most frequently studied, followed by Thailand, India, Brazil, and China. This signifies a substantial interest in exploring the implementation and management of GHRM and GSCM practices within these countries.

However, it is essential to note that the review process has identified a limited number of studies conducted in developed and least developed countries. Specifically, only one study from Ghana was found in the African context and two studies from the United Kingdom and Italy in the developed European context. This observation suggests the need for further research to be conducted in these regions to achieve a comprehensive understanding of GHRM and GSCM practices on a global scale. Furthermore, the review underscores the importance of incorporating diverse cultural and economic contexts in research on GHRM and GSCM practices, highlighting the need for cross-country and cross-regional investigations to deepen our knowledge and appreciation of these practices and their variations in different settings.

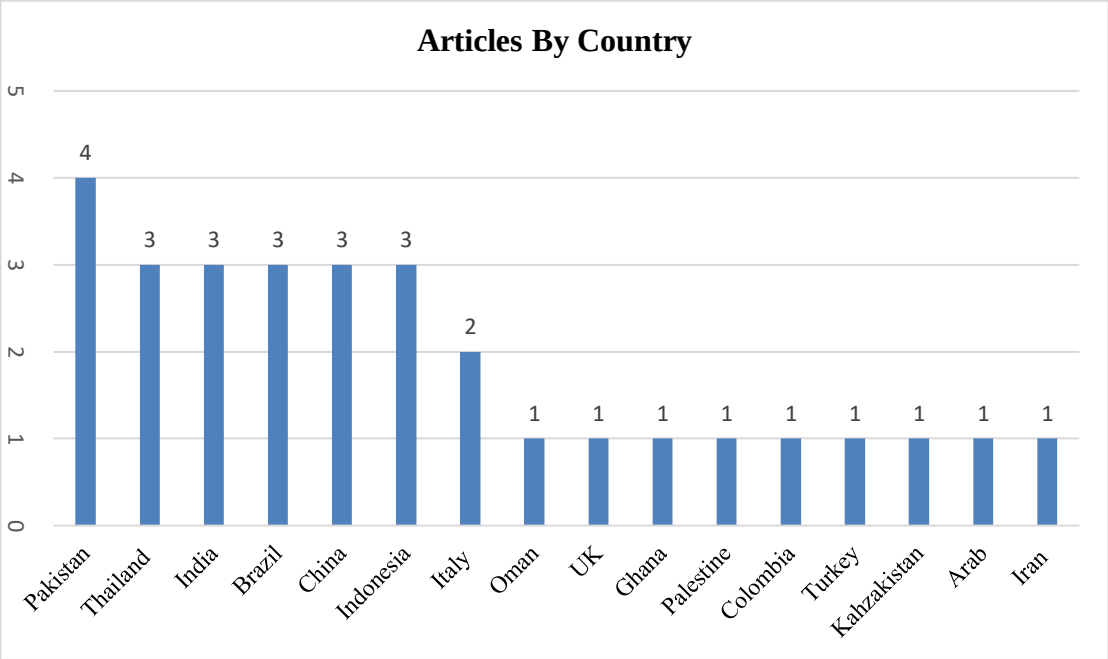

Fig. 5. Articles by country

3.5. Co-occurrence of keywords analysis

The co-occurrence of keyword analysis conducted using VOSviewer software by taking the data obtained from the Scopus and Web of Science databases. Out of the initial pool of 244 keywords, a select group of 10 keywords meets the minimum requirement of at least five occurrences, leading to the formation of several distinct clusters. The dominant cluster of "Green Supply Chain Management", with an occurrence of 23 and a total link strength of 68, signifies a strong emphasis on integrating environmentally friendly practices into supply chain management processes. The related group of "Green Human Resource Management" maintains a significant link strength of 62, highlighting the focus on incorporating environmental concerns into human resource management. The "Supply Chain Management" cluster and the "Human Resource Management" cluster, while less prominent, demonstrate ongoing research and scholarly discussions in their respective domains. The "Sustainable Development" cluster, despite a lower occurrence, indicates its significance as a research topic within the field. Additionally, clusters centred around environmental and resource management provide valuable information on specific aspects receiving attention within the broader research landscape. *Tab.* 2 concisely summarises the top 10 co-occurred keywords, providing their respective occurrences and total link strength. Fig. 6 presents a carefully constructed network map showing the connections between the clusters, making it easier to understand and inviting observers to explore and learn more about the keywords analysed. In general, the analysis provides valuable insights into the research themes and connections within the domains of supply chain management, human resource management, and sustainable development, emphasising the integration of environmental concerns and highlighting ongoing research efforts in these areas.

Tab. 2. Top keywords in the co-occurrence of keywords analysis

Rank	Keyword	Occurrences	Total Link Strength
1	Green Supply Chain Management	23	68
2	Green Human Resource Management	20	62
3	Supply Chain Management	15	65
4	Human Resource Management	12	60
5	Sustainable development	9	42
6	Environmental performance	7	11
7	Resource Allocation	7	41
8	Environmental Management	6	31
9	Natural Resource Management	5	28
10	Sustainable Operations	5	30

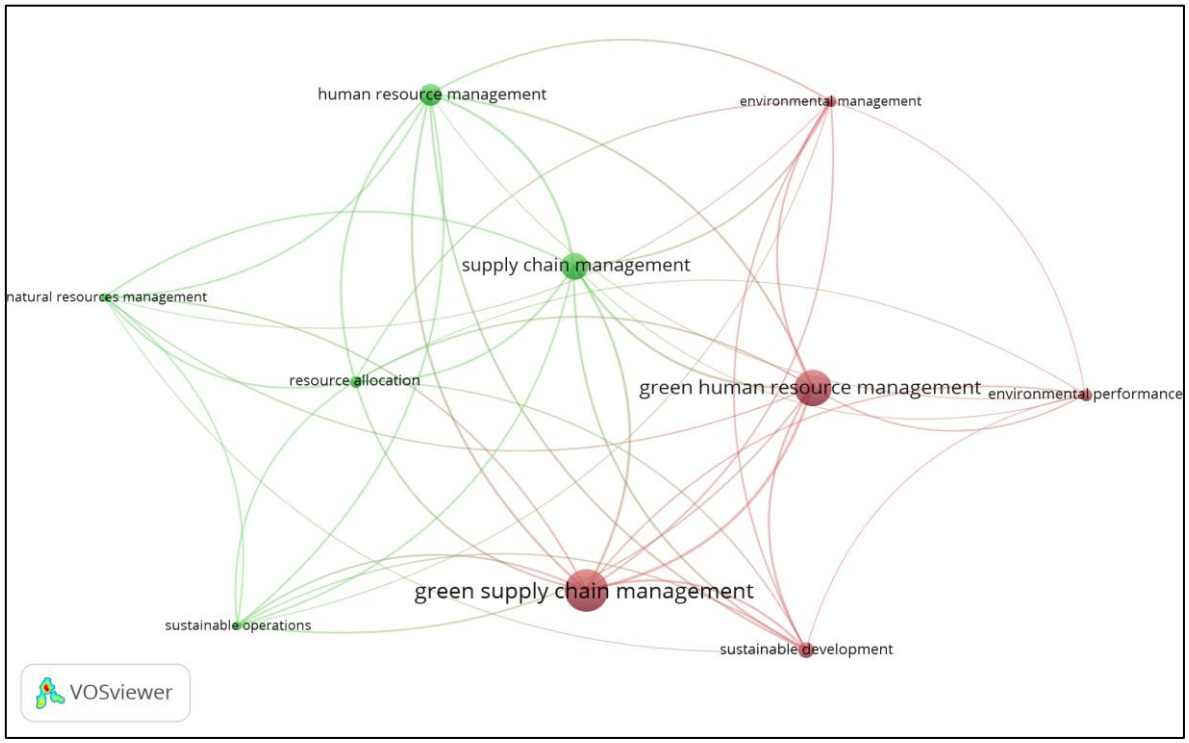

Fig. 6. Co-occurrence of keyword analysis network in GHRM & GSCM

4. Classification of the Studies

This study classified the 30 research articles that were reviewed into two main focus areas: the conceptualization of GHRM and GSCM practices and the joint performance implications of GHRM and GSCM practices. The first focus area examines the various theories and models proposed to explain the nature and scope of GHRM and GSCM practices. It also reviews the literature on the key concepts and principles that are central to understanding these practices.

The other focus area investigates the relationship between GHRM and GSCM practices and their impact on organisational performance. It reviews the literature on the different ways in which GHRM and GSCM practices can be integrated to achieve better performance outcomes.

4.1. Conceptualisation of GHRM and GSCM practices

Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) are multidimensional constructs that aim to incorporate environmentally sustainable practices into organisational management. GHRM has five main dimensions, including green recruitment, selection, training and development, performance management, and compensation and rewards [19]. GSCM has internal and external dimensions, such as Internal Environmental Management, Eco-design, Green Purchasing, Cooperation with customers, and Investment recovery [3]. Although specific dimensions may vary between studies, the goal remains the same: integrating sustainable practices into organizational management.

Studies that fall into this category aim to explore the relationship between GHRM and GSCM. Some of these studies have found that GHRM and GSCM are linked through shared goals and practices [6], and that they can create synergies in manufacturing firms [7]. Green training has also been found to positively affect GSCM and contribute to environmental performance [16]. Additionally, a green policy can help organizations implement Corporate Social Responsibility (CSR) practices and enhance sustainable supply chain management [20]. Other studies have found that supply chain integration plays a key role in the relationship between GSCM and organizational culture [21], and that digital technologies can enhance GHRM practices and enable the adoption of GSCM practices [22].

4.2. Performance outcome of GHRM and GSCM

Several previous studies examined the joint effect of GHRM and GSCM practices on sustainable performance, such as environmental, economic and social performance in different context in manufacturing and service sectors. Studies that fall into this category aim to examine the impact of GHRM and GSCM practices on organisational performance. These studies have found that GHRM and GSCM practices have a significant

positive impact on sustainable performance [9], [23], and that employee participation and training are critical to the success of GHRM and GSCM practices [24], [25]. Additionally, employee involvement and training are critical for the success of GHRM and GSCM practices [26]. GHRM practices have been found to positively impact environmental performance, and GSCM practices mediate this relationship [27] , while green HRM practices have a positive impact on green supply chain management and SMEs' environmental performance [24]. Some studies have also found that GHRM practices can improve environmental cooperation in organisations by providing employees with the ability, motivation, and opportunity to engage in environmentally responsible behaviour [28].

In general, these studies contribute to our understanding of the relationship between GHRM and GSCM, and their impact on organizational performance. They provide insight into the role of employee participation and training in the success of GHRM and GSCM practices, and the importance of a green policy and supply chain integration in enhancing sustainable performance. The findings of these studies have practical implications for managers and policymakers who are interested in promoting sustainable practices in their organizations. The following Table 3 provides summary of key findings from reviewed studies.

Tab. 3. Summary of the main findings of the studies

Authors	Methodology	Industry /Context	Findings
Khan et al., [29]	Quantitative	China /Manufacturing	Emotional intelligence mediates the relationship between green supply chain management practices and sustainable performance.
Jabbour & de Sousa Jabbour, [6]	Conceptual	-	Human resource management and green supply chain management are linked through shared goals and practices.
Trujillo-Gallego et al., [22]	Quantitative	Colombia/ Manufacturing	Digital technologies can improve green human resource management practices and enable the adoption of green supply chain management practices.
Singh & El-Kassar, [10]	Quantitative	Middle East	Big data analytics can be used to develop sustainable capabilities in the context of green supply chain management and green human resource management.
Nejati et al., [7]	Quantitative	Iran/ Manufacturing	Green human resource management and green supply chain management can create synergies in manufacturing firms, but employees' resistance to change can moderate the relationship.
Yu et al., [15]	Quantitative	China/ Automotive Industry	Green human resource management practices can improve environmental cooperation in organisations by providing employees with the ability, motivation, and opportunity to engage in environmentally responsible behaviour.
Sittisom & Mekhum, [30]	Qualitative	Thailand/ Manufacturing	Green human resource practices can moderate the relationship between external supply chain management factors and social performance in the Thai manufacturing industry.
Mishra, [31]	Mixed/Case studies	India/ Manufacturing	Green human resource management can contribute to sustainable organizational development in emerging economies by addressing environmental, social, and economic concerns.
Zaid et al., [9]	Quantitative surveys	Palestine/ Manufacturing	GHRM and GSCM practices have a significant positive impact on sustainable performance. Employee training, participation, and empowerment are crucial to the success of GHRM and GSCM practices.
Wongleedee, [32]	Quantitative	Thailand Pharmacies	Both GHRM and GSCM have a significant positive impact on sustainable performance. Employee performance mediates the relationship

			between GHRM/GSCM and sustainable performance.
Gedam et al., [33]	Fuzzy-DEMATEL method	Indian power sector	Lack of awareness, limited knowledge, and insufficient resources are the major barriers to the adoption of sustainability practices in the Indian power sector.
Bhardwaj, [20]	Quantitative	India/ Manufacturing	A green policy can help organisations implement CSR practices and improve sustainable supply chain management.
Naseer et al., [26]	Quantitative	Pakistan	GHRM and GSCM practices positively influence sustainable performance. Employee participation and training are critical to the success of GHRM and GSCM practices.
Aldaas et al., [24]	Quantitative	Oman/ Service Sector	Green HRM practices have a positive impact on green supply chain management and SMEs' environmental performance. Employee participation and training are crucial for the success of green HRM and green supply chain management practices.
Acquah et al., [23]	Quantitative	Ghana	GHRM and GSCM practices have a significant positive impact on performance. Employee participation and training are critical for the success of GHRM and GSCM practices.
Teixeira et al., [16]	Quantitative	Brazil	Green training positively affects green supply chain management and contributes to environmental performance. Employee participation and participation are essential for the success of green training and green supply chain management practices.
Maskuroh et al., [25]	Quantitative	Indonesia/ Mining	GHRM and GSCM practices have a significant positive impact on sustainable performance in the nickel mining industry in Indonesia. Employee training and participation are essential for the success of GHRM and GSCM practices.
Chiappetta Jabbour et al., [34]	Qualitative	Brazil/ manufacturers of automotive batteries	The CSFs for the proactivity of GSCM include human aspects, such as employee empowerment, training, and communication. GHRM practices are essential to develop these human aspects and promoting GSCM proactivity.
Saeed, [27]	Quantitative	Pakistan/ Manufacturing	GHRM practices positively impact environmental performance, and GSCM practices mediate this relationship.
Longoni et al., [8]	Qualitative	Italy/ Multiple Industries	GHRM practices facilitate GSCM practices by enhancing employee engagement, training, and communication. GHRM practices also promote cross-functional collaboration and stakeholder engagement for environmental management.

5. Conclusion and Implications for Future Study

This study reviews the literature from 2016 to 2023 to investigate the relationship between Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) practices. The finding of this review demonstrate that there is growing interest among researchers in addressing the issue of GHRM and GSCM in a joint fashion, in order to determine their joint impact on sustainable performance. The review also found that the human resource aspect of environmental participation is a key ingredient for the successful implementation of GSCM, and other environmental initiatives. As such, integrating GHRM with other organisational functions becomes vital in achieving the environmental and financial goals of firms. Furthermore, the review indicates the need for more studies to develop a comprehensive framework by integrating organisational functions for effective environmental management.

The review process also identified that majority of the studies are conducted using a quantitative

survey approach. This highlights a potential gap in balancing the proportion of quantitative, qualitative, and mixed-method approaches. To address this, it is recommended for future studies to apply mixed-method studies to gain deeper insight into the relationship between GHRM and GSCM practices, their combined effect on performance, and to increase the credibility and reliability of the findings.

The findings of the review contribute to both practitioners and researchers interested in understanding the comprehensive view of the relationship between GHRM and GSCM practices. For researchers, the study brings together different studies conducted by different authors from different contexts to examine and conceptualizing the link between GHRM and GSCM practices and their joint as well as independent effect on sustainable performance. Despite this, the study indicates that there is still a lack of sufficient studies to examine the relationship between GHRM and GSCM practices and, therefore, opportunities to advance research to conceptualise and bring a comprehensive view of Green organisational practice for better environmental and financial outcomes.

The other finding of the study was about the study context. The analysis revealed that a significant majority of the studies were conducted in emerging/developing countries such as Thailand, Brazil, China, and India. Developed and least developed countries are not well represented in the literature. This may be due to the fact that emerging/developing countries are more likely to engage in manufacturing than developed and least developing countries, which inherently contributes to environmental pollution. The study findings also provide significant information for practitioners, to better understand the role of integrating GHRM and GSCM practices in bringing sustainable competitive advantage by improving environmental, financial, and social performance.

5.1. Future research direction

Understanding the relationship between Green Human Resource Management (GHRM) and Green Supply Chain Management (GSCM) is crucial for organisations aiming to enhance sustainable performance. Therefore, based the result of this systematic review the following direction forwarded for futures studies;

- Explore ways to adapt GHRM practices to improve GSCM efficiency in various industry environments and dynamic market environments. This entails analysing different industries, grasping their specific needs, and suggesting customised approaches to improve sustainability in each setting.
- Research into the influence of external factors such as customer preferences, competitor behaviour and technological advances on the effect of GHRM and GSCM practices on sustainable performance. Researchers may provide insights into how various elements interact and influence sustainable performance results by using modern analytical tools and data sources.
- Examine how to designing GHRM practices to attract and retain talent with sustainability expertise to foster long-term organisational sustainability. This may need investigating innovative recruiting strategies, specialised training programmes, and career advancement opportunities designed for sustainability-oriented positions inside companies.
- Develop robust methodologies to effectively measuring the impact of GHRM and GSCM practices on sustainability. This may require combining qualitative and quantitative methods, using multidisciplinary frameworks, and using creative measuring techniques to accurately assess the many aspects of sustainability consequences.
- Conduct longitudinal studies to assess the long-term impact of GHRM and GSCM practices on sustainability, capturing complex dynamics and potential cascading effects over time. Researchers may analyse organisational practices and performance measurements over long periods to understand complex dynamics, identify possible cascading impacts, and get insights into the long-term success of sustainability programs.

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