

GREEN HUMAN RESOURCE MANAGEMENT AND SUSTAINABLE PERFORMANCE: A BIBLIOMETRIC AND SYSTEMATIC REVIEW OF RESEARCH TRENDS AND THEMATIC EVOLUTION

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Received: 10 April 2026; Revised: 7 May 2026; Accepted: 16 May 2026

ABSTRACT

This study offers a comprehensive bibliometric and systematic review of Green Human Resource Management (GHRM) literature from 2010 to 2025, aiming to clarify its evolution and contributions to sustainable performance (SP). A total of 4,665 records were initially identified, with 196 peer-reviewed articles selected for in-depth analysis. Using VOSviewer and thematic synthesis, the study reveals three major research clusters: GHRM practices and employee outcomes; leadership and CSR-based enablers; and green innovation supporting low-carbon transitions. The results show a clear shift from compliance-oriented to strategic and behavioral perspectives, especially in energy-intensive sectors. The study integrates the Resource-Based View, AMO, Social Cognitive Theory, and Norm Activation Model into a multi-level framework that captures how GHRM enhances green capabilities and fosters pro-environmental behavior. It also highlights gaps in longitudinal research, carbon performance metrics, and digital enablers. The review contributes by mapping intellectual trends and providing implications for aligning HR strategies with climate innovation agendas, particularly in sectors like steel under emerging policy frameworks such as the EU Green Deal.

Keywords: Green Human Resource Management (GHRM), sustainable performance, bibliometric analysis, AMO theory, low-carbon transition, sustainable leadership.

1. INTRODUCTION

In the context of global sustainability challenges, organizations are increasingly under pressure to integrate environmental considerations into their core strategies. The growing emphasis on corporate responsibility, green innovation, and sustainable leadership has driven the evolution of new management paradigms, among which Green Human Resource Management (GHRM) has gained remarkable attention. GHRM refers to the integration of environmental management principles into human resource practices to enhance both ecological and organizational performance [1, 2]. Over the past decade, the number of studies in this domain has grown substantially, reflecting the academic community's recognition of the human factor as a key driver of sustainability [3, 4].

Despite this progress, the field of GHRM remains fragmented and dispersed across diverse contexts and research approaches [5, 6]. Prior studies have primarily focused on specific relationships such as the link between GHRM and green performance, employee behavior, or corporate social responsibility without systematically mapping the intellectual and thematic structure of the field [4, 7, 8]. Moreover, while several narrative reviews have summarized GHRM practices and drivers, few have employed bibliometric and systematic

review methods to uncover the knowledge clusters, research trends, and future directions of this rapidly evolving domain. This gap underscores the need for a comprehensive, data-driven synthesis of GHRM research [9-11].

Therefore, this study aims to analyze and visualize the intellectual landscape of GHRM research by integrating bibliometric and systematic review techniques. Specifically, the study seeks to: (1) identify publication trends, influential authors, and leading journals; (2) map the intellectual and thematic structure of GHRM using co-citation and co-occurrence analyses; and (3) highlight emerging themes and future research opportunities. The dataset comprises articles indexed in the Scopus database from 2010 to 2025, analyzed using EndNote and VOSviewer software.

This study contributes to literature in three significant ways. First, it provides one of the most comprehensive and up-to-date syntheses of GHRM and sustainability research from 2010 to 2025, with particular attention to environmental management and the steel industry, an influential yet underexplored sector in emerging economies. Compared with prior reviews such as Pham et al, Yong et al, and Roscoe et al. [2, 3, 12], this study expands the scope by covering a longer period (2010–2025) and integrating both bibliometric and systematic review techniques, thereby offering a more rigorous and holistic synthesis of the field. Second, the study uniquely combines bibliometric analysis with systematic review techniques to deliver a rigorous, multidimensional mapping of the field. This dual-method approach, rare in the GHRM literature, offers a more robust assessment of research patterns, knowledge clusters, and thematic evolution. Third, the study develops an integrative theoretical framework linking five major perspectives AMO, RBV, SCT, NAM, and EOT to explain how GHRM practices shape green behaviors, environmental initiatives, and organizational sustainability outcomes. This multi-theoretical integration advances conceptual clarity and provides a holistic foundation for future empirical work.

The remainder of this paper is structured as follows. Section 2 presents the literature review and theoretical background of GHRM, outlining its conceptual foundations and strategic roles in sustainability. Section 3 describes the methodology, including data collection, selection criteria, and analytical techniques. Section 4 reports the results of the bibliometric and thematic analyses, followed by a discussion and conclusion in Section 5.

2. LITERATURE REVIEW AND THEORETICAL BACKGROUND

2.1. Conceptual Foundations of GHRM

In recent years, Green Human Resource Management (GHRM) has emerged as a vital component of sustainable business strategies, reflecting the rising global emphasis on environmental responsibility and organizational accountability. The integration of human resource practices with environmental objectives has attracted growing scholarly and managerial attention [1-3]. This section provides an overview of the theoretical foundations of GHRM, tracing its conceptual evolution, strategic contributions, and linkages with sustainable performance.

GHRM is rooted in the intersection of human resource management (HRM), environmental management (EM), and sustainable development (SD). Renwick et al. [1] conceptualized GHRM as the adoption of HRM policies and practices that promote sustainable resource use and foster pro-environmental behavior among employees. Roscoe et al. [2] further emphasized the alignment between HRM and environmental strategies, arguing that organizations can embed environmental values into recruitment, training, performance appraisal, and compensation systems. Ren et al. [4] viewed GHRM as a mechanism for translating environmental strategy into organizational capability, while Pham et al. [3] framed

it as a strategic resource under the Resource-Based View (RBV), capable of cultivating green culture and enabling sustained competitive advantage.

2.2. Mechanisms and Strategic Roles of GHRM

Fundamentally, GHRM represents a system of HR practices designed to enhance employees' green abilities, motivation, and opportunities, consistent with the AMO framework [13, 14]. These practices include green recruitment and selection, green training and development, green performance appraisal, green compensation and rewards, and employee involvement in environmental initiatives [1, 3]. Through these mechanisms, organizations can embed sustainability values across the HR cycle and foster a culture of environmental stewardship.

The strategic role of GHRM has been supported by a growing body of empirical research. From the RBV perspective, GHRM serves as an intangible asset that enhances organizational capabilities and long-term sustainability [3, 4]. The AMO-based viewpoint further highlights how GHRM drives environmental behavior: it develops employees' green abilities, motivates green actions through incentives and recognition, and provides opportunities for involvement in environmental initiatives [2, 15]. When effectively implemented, these practices contribute to a "green organizational ecosystem" that supports innovation, operational efficiency, and improved environmental performance [16]. GHRM has also been linked to the development of organizational green innovation capabilities, enabling firms to integrate environmental considerations into technological and process improvements [17].

GHRM also plays an essential role in advancing sustainable performance (SP). Numerous studies show that GHRM influences both direct and indirect pathways toward SP through mechanisms such as green corporate social responsibility (Green CSR), environmental initiatives, low-carbon behavior, and green innovation [12, 18]; Saeed et al. and Zaid et al. [8, 19] demonstrated that GHRM strengthens Green CSR, thereby enhancing organizational reputation and stakeholder trust. Hameed et al. [18, 20] found that GHRM improves employees' environmental awareness and participation in eco-friendly activities, while Yusof et al. [21] reported positive effects on both environmental and financial outcomes. Foundational studies in manufacturing contexts demonstrate that environmental initiatives significantly enhance operational efficiency and sustainability outcomes [22, 23]. Recent evidence also highlights that green innovation is critical for enabling low-carbon transitions in energy-intensive industries, particularly through process redesign and cleaner technologies [24]. Eco-efficiency practices have been shown to strengthen the environmental performance of industrial firms, particularly in high-pollution sectors [25]. Sustainable Leadership (SL) further reinforces these effects by cultivating shared sustainability visions and empowering employees to engage in green behaviors [26, 27]. Additionally, sustainable leadership promotes long-term ethical commitment and supports the institutionalization of environmental values across organizational systems [28].

2.3. Underlying Theoretical Perspectives

Overall, GHRM evolves beyond a functional HR tool into a strategic enabler of green transformation [4, 26]. By aligning HR systems with sustainability goals, organizations can cultivate dynamic environmental capabilities, foster employee commitment, and achieve long-term competitive advantage [3, 4, 8, 26].

To further consolidate its theoretical grounding, the present study incorporates five complementary perspectives:

RBV explains how GHRM functions as a strategic capability that builds rare and inimitable green competencies.

AMO clarifies how employees’ green abilities, motivations, and opportunities shape environmentally responsible behavior.

SCT highlights the role of leadership modelling and self-efficacy in enabling green actions.

NAM emphasizes moral obligation and personal responsibility as drivers of pro-environmental behavior.

EOT provides a broader strategic orientation that integrates both internal and external environmental governance.

While each theoretical perspective provides valuable insights, no single theory alone is sufficient to fully explain the complex relationship between GHRM and sustainable performance.

Therefore, this study integrates multiple complementary theories into a unified multi-level framework. Specifically, RBV and EOT explain how GHRM builds organizational capabilities and strategic environmental orientation; AMO clarifies how HR practices translate into employee engagement mechanisms; while SCT and NAM provide behavioral and psychological explanations for pro-environmental actions.

This multi-theoretical integration allows for a more comprehensive understanding of how GHRM influences sustainable performance through interconnected organizational, behavioral, and individual-level pathways.

Based on these theoretical perspectives, Figure 1 illustrates the conceptual framework developed from these theoretical foundations, depicting the relationship between GHRM practices, their mediating mechanisms (Green CSR, EMIs, LCB), and the moderating role of Sustainable Leadership in shaping organizational sustainable performance.

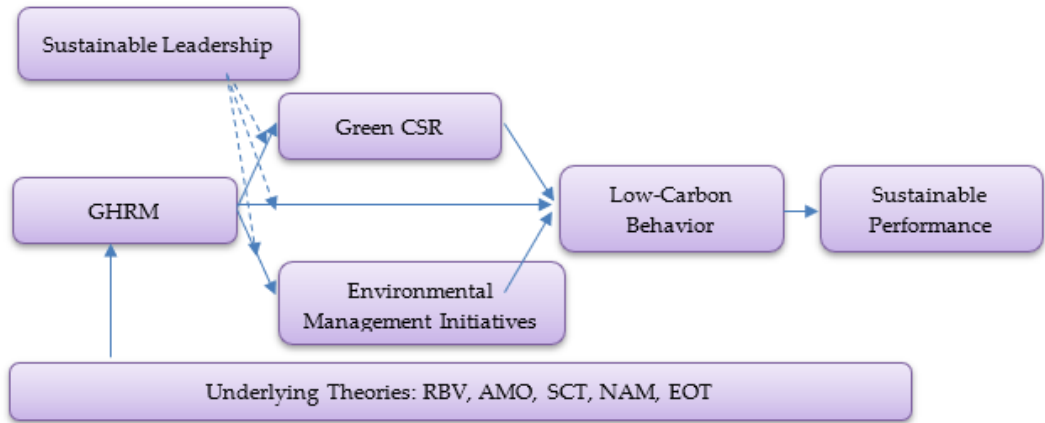


Figure 1. Conceptual Framework of GHRM and Sustainable Performance

Source: Author's compilation

3. METHODOLOGY

3.1. Data Source and Search Strategy

This study applies a bibliometric analysis combined with a systematic literature review following established guidelines [9, 10]. Data were collected from the Scopus database [9, 29], focusing on English-language publications related to GHRM in energy-intensive industries during the period 2010–2025.

A keyword-based search was conducted in the Title, Abstract, and Keywords fields using GHRM-related terms and industry-specific keywords (e.g., steel, manufacturing, energy-intensive industries).

The initial search yielded 4,665 records. After screening and applying inclusion criteria, a final sample of 196 peer-reviewed articles was retained for analysis (see Figure 2).

The detailed search query is available upon request.

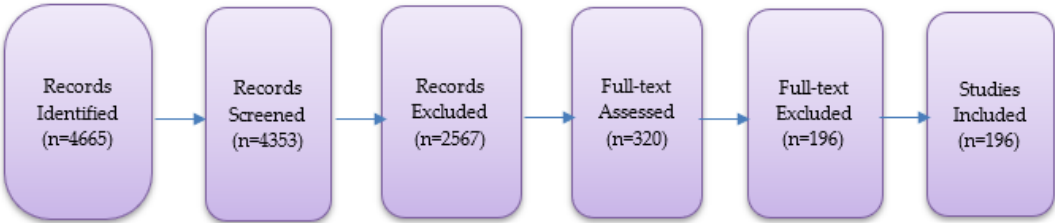


Figure 2. PRISMA 2020 flow diagram outlining the identification, screening, eligibility, and inclusion process.

Source: Author's calculation

Search Query (Scopus):

TITLE-ABS-KEY (

("green human resource" OR "GHRM" OR "green HRM practices"

OR "sustainable leadership" OR "green leadership"

OR "green corporate social responsibility" OR "green CSR"

OR "environmental initiatives" OR "green innovation"

OR "sustainable performance" OR "environmental performance"

OR "low-carbon behaviour" OR "low-carbon behavior"

OR "pro-environmental behaviour" OR "pro-environmental behavior")

AND ("steel industry" OR "iron and steel" OR "manufacturing" OR "energy-intensive industry"))

AND (PUBYEAR > 2009 AND PUBYEAR < 2026)

AND (LIMIT-TO (LANGUAGE, "English"))

This search strategy ensured comprehensive coverage of the GHRM literature within energy-intensive industries during the 2010-2025 period.

3.2. Data Analysis

We conducted a bibliometric analysis using VOSviewer [30], applying performance analysis and science mapping techniques [9]. Performance analysis examined publication output and country-level contributions, while science mapping explored co-authorship and keyword co-occurrence networks.

For co-authorship analysis, country-level data were used to identify leading contributors and collaboration patterns. For keyword analysis, author keywords were standardized to ensure consistency, and a minimum occurrence threshold (≥ 5) was applied [31]. Co-occurrence maps were generated using VOSviewer's clustering algorithm to identify major research themes.

To examine thematic evolution, the study period was divided into three phases (2010–2014, 2015–2019, and 2020–2025), and overlay visualization was used to track changes in research focus over time.

3.3. Systematic Qualitative Review

To complement the bibliometric analysis, a systematic qualitative review was conducted to interpret key themes, mechanisms, and research gaps. Full-text analysis of the selected articles provided contextual insights into GHRM practices, antecedents, and outcomes in energy-intensive industries. This combined approach enhances the robustness and depth of the study.

4. RESULTS

4.1. Descriptive Analysis

This section presents the descriptive statistics of the retrieved dataset (see Figure 3), including publication output, leading journals, and country-level collaboration patterns. A total of 4,665 publications were retrieved from the Scopus database covering the period 2010–2025, of which 196 documents met the inclusion criteria after duplicate removal and relevance screening. Among these, 196 papers were published in international journals indexed in SSCI or SCI.

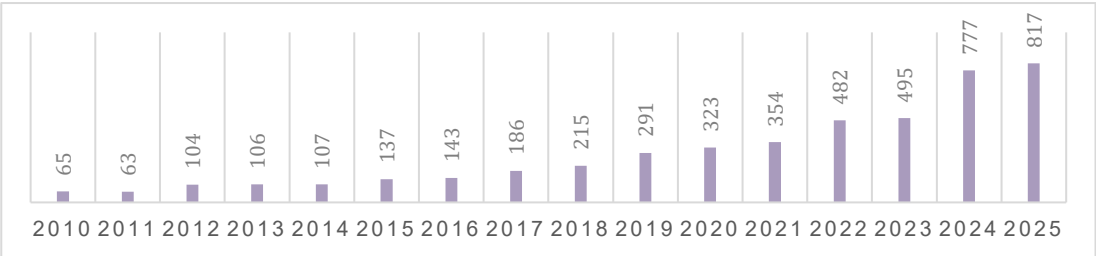


Figure 3. Annual number of publications on GHRM and Sustainable Performance (2010–2025)
Source: Authors’ analysis using VOSviewer

The number of publications has increased steadily over the past 15 years, indicating the growing academic interest in Green Human Resource Management (GHRM) and its link to Sustainable Performance (SP). Early publications were sparse before 2013, but since 2018, the annual output has surged, reflecting a shift in focus toward green management, sustainability leadership, and low-carbon practices in industrial contexts. This upward trend demonstrates a growing scholarly commitment to linking human resource management practices with sustainability-oriented industrial transformation.

Leading journals publishing studies in this domain include Sustainability (Switzerland) (53 papers), Journal of Cleaner Production (52), Business Strategy and the Environment (18), Journal of Environmental Management (18), Corporate Social Responsibility and Environmental Management (14), Frontiers in Psychology (8), Environment, Development and Sustainability (8), Journal of Manufacturing Technology Management (6), International Journal of Productivity and Performance Management (6), and Technological Forecasting and Social Change (5). These journals collectively account for over 90% of the analyzed articles, demonstrating that research on GHRM and sustainable performance is mainly situated at the intersection of environmental management, organizational behavior, and strategic sustainability.

Geographically, China, India, the United States, South Korea, Germany, and Malaysia emerge as the most active contributors, forming dense international co-authorship networks. Collaboration between Asian and European scholars have become increasingly prominent

after 2020, showing the global relevance of the GHRM–sustainability agenda in energy-intensive industries such as steel. (see Figure 4).

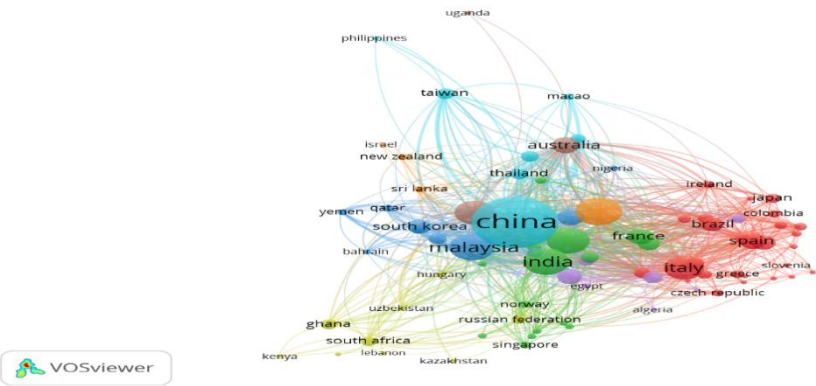


Figure 4. Country collaboration network (VOSviewer output) [30].

Source: Authors’ analysis using VOSviewer

4.2. Co-Occurrence Analysis of Keywords

Using the co-occurrence method in VOSviewer, a total of 684 author and index keywords were analyzed. A threshold of minimum five occurrences per keyword was applied to ensure analytical clarity [30]. The resulting network of 94 active keywords was visualized to identify key research foci and conceptual relationships.

The keyword network shows strong links among “green human resource management,” “sustainable performance,” “environmental performance,” “corporate social responsibility,” “green innovation,” “leadership,” “low-carbon behavior,” and “employee engagement.” These nodes form the structural backbone of the GHRM–sustainability research field (see Figure 5).

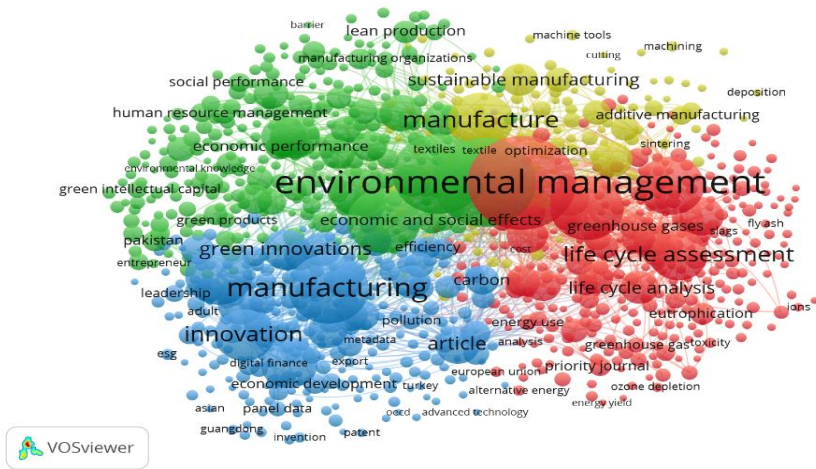


Figure 5. Co-occurrence Network Map (VOSviewer output) [30].

Source: Authors’ analysis using VOSviewer

Three major keyword communities were detected (see Table 1):

Cluster 1 – GHRM Practices and Organizational Outcomes: includes green training, green recruitment, employee green behavior, sustainable performance, and environmental management.

Cluster 2 – Leadership, CSR, and Strategic Enablers: includes sustainable leadership, green corporate social responsibility, organizational culture, managerial support, stakeholder pressure.

Cluster 3 – Innovation and Industrial Transition: includes green innovation, eco-efficiency, low-carbon manufacturing, energy-intensive industry, circular economy.

Table 1. Thematic clusters of keyword co-occurrence analysis

Cluster	Main Keywords (≥ 5 occurrences)	Representative Theme
1	GHRM, green training, employee behavior, sustainable performance, environmental management	Green HRM practices and organizational outcomes
2	Sustainable leadership, CSR, stakeholder pressure, organizational culture, managerial support	Leadership and CSR as strategic enablers
3	Green innovation, eco-efficiency, low-carbon manufacturing, circular economy, energy-intensive industry	Innovation and industrial sustainability transition

Source: Authors' analysis using VOSviewer

Collectively, these clusters delineate the conceptual foundation of the GHRM, sustainability literature, integrating organizational, behavioral, and technological dimensions.

4.3. Thematic Structure and Conceptual Clusters

The conceptual structure emerging (see Figure 6) from co-occurrence mapping suggests that research on GHRM and sustainability has evolved around three interconnected knowledge domains, consistent with prior bibliometric frameworks [29, 31]:

Theme 1 – GHRM Practices and Sustainable Performance: This theme integrates studies on how GHRM practices (recruitment, training, compensation, appraisal) influence organizational and environmental performance. It reflects the micro-level mechanism connecting HR policies with employee behavior and firm sustainability outcomes [4, 15, 19].

Theme 2 – Sustainable Leadership and Green CSR: This cluster covers works linking leadership, ethical orientation, and CSR engagement to environmental and social performance. It highlights the mediating role of green culture and the moderating effect of sustainable leadership on the GHRM–SP relationship [26, 28].

Theme 3 – Environmental Innovation and Low-Carbon Transition: Research in this cluster explores green innovation, eco-efficiency, and circular economy entrepreneurship as macro-level mechanisms to achieve sustainability in resource-intensive industries. The steel sector, in particular, is studied as a testbed for low-carbon technology adoption and environmental initiatives [12, 24].

To visualize the relative intensity of these themes, Figure 6 presents the **thematic network and cluster density map**, highlighting the concentration of research around the core topics of *environmental management*, *sustainability*, and *manufacturing*. The density visualization highlights the most intensively studied themes within the GHRM–sustainability field. Bright yellow zones represent core research areas, whereas blue regions correspond to emerging or peripheral topics.

To consolidate the findings derived from the keyword co-occurrence analysis, the three thematic clusters were further synthesized into a structured summary.



Figure 6. Thematic network and cluster density map.

Source: Authors' analysis using VOSviewer (Density Visualization), Bukar, Umar Ali et al [32].

These clusters reflect the intellectual organization of the GHRM–SP literature and clarify how the field has evolved around practices, strategic enablers, and innovation-oriented sustainability transitions. Table 2 provides an overview of each cluster, including representative keywords, core research topics, key contributing authors, and potential future research directions. This synthesis enhances the interpretability of the thematic structure and serves as a foundation for understanding subsequent trends presented in Section 4.4.

Table 2. An overview of each cluster, including representative keywords, core research topics, key contributing authors

Cluster / Theme	Representative Keywords	Core Topics	Key Authors	Future Research Directions
Cluster 1 – GHRM Practices and Organizational Outcomes	GHRM, green training, green recruitment, employee green behavior, environmental management, sustainable performance	Micro-level mechanisms: how GHRM practices (recruitment, training, appraisal, rewards) shape employee behavior and organizational sustainability outcomes	[1]; [2]; [4] [15]; [3]; [19]; [12].	Multi-level AMO testing; GHRM effectiveness in heavy industries; integrating digital HRM tools into green HR practices
Cluster 2 – Sustainable Leadership, CSR, and Strategic Enablers	Sustainable leadership, green CSR, organizational culture, managerial support, stakeholder pressure	Leadership-driven sustainability; GHRM → green CSR mechanisms; ethical leadership; organizational culture as green enabler	[27]; [26]; [28]; [8]; [19]; [5].	Examining SL as moderator; cultural & ethical mechanisms; cross-cultural CSR behavior; integrating NAM/SCT with GHRM
Cluster 3: Green Innovation and Low-Carbon Transition	Green innovation, eco-efficiency, circular economy, low-carbon manufacturing, energy-intensive industry	Technological and process transformation; innovation capability; decarbonization pathways; sustainability in steel and heavy industries	[25]; [12]; [24]; [17]; [22, 23]; [25].	Linking GHRM with circular economy; low-carbon transitions in steel; green innovation capability; policy-driven sustainability

Source: Compiled by the author

4.4. Evolution of Research Topics

The temporal overlay visualization reveals a clear chronological progression in the field, consistent with the co-word evolution model of [31]. Based on the average publication year of keywords, three distinct phases are observed:

Phase I (2010–2014): Foundation Stage: Early studies focused on environmental management, ISO 14001, and life-cycle assessment. Research was largely technical, emphasizing environmental performance and compliance.

Phase II (2015–2019): Integration Stage: Research expanded to green innovation, sustainable manufacturing, and CSR. Organizational perspectives began to integrate human resource practices and managerial support into sustainability strategies.

Phase III (2020–2025): Behavioral and Strategic Stage: The most recent phase highlights GHRM, sustainable leadership, employee engagement, low-carbon behavior, and circular economy entrepreneurship. The focus has shifted from environmental systems to behavioral and cultural mechanisms driving sustainable performance, especially in high-emission sectors like steel.

To visualize this progression, Figure 7 presents the overlay map generated using VOSviewer, where the color gradient represents the average publication year of keywords. Blue nodes correspond to earlier studies emphasizing environmental and technical aspects (2010–2014), green nodes reflect mid-phase integration themes (2015–2019), and yellow-to-orange nodes indicate emerging behavioral and strategic themes (2020–2025). This evolution underscores a paradigm shift from technology- and compliance-driven sustainability toward human-centered, leadership-oriented, and innovation-based approaches within the GHRM–sustainability nexus.

The overlay map illustrates the temporal evolution of research topics in the GHRM–sustainability field. Early studies (in blue) concentrated on environmental management and life-cycle assessment (2010–2014); the mid-phase (in green) focused on green innovation, CSR, and sustainable manufacturing (2015–2019); and recent studies (in yellow–orange) highlight GHRM, sustainable leadership, and low-carbon behavior (2020–2025).

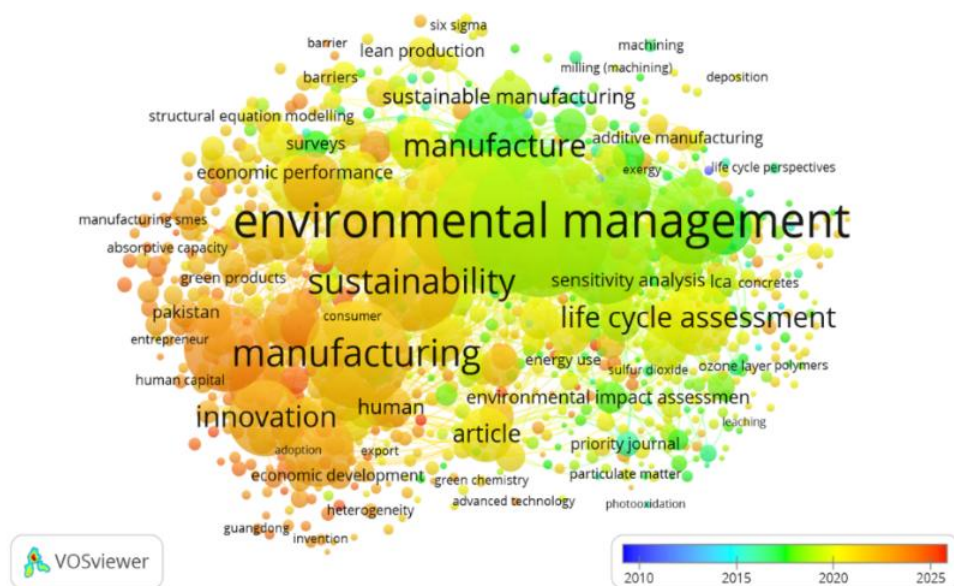


Figure 7. Overlay visualization of keyword evolution (2010–2025) [32].

Source: Authors' analysis using VOSviewer

5. DISCUSSION

5.1. Emerging Thematic Evolution

Our review reveals a clear evolution of GHRM and sustainable performance research from a compliance-oriented approach toward a more strategic and human-centered perspective. Early studies primarily conceptualized GHRM as a set of technical HR practices aimed at improving environmental performance and regulatory compliance. However, recent research increasingly emphasizes employees' green behavior, engagement, and environmental awareness as key mechanisms driving sustainability outcomes [3, 8].

This shift indicates a fundamental transformation in the field, where GHRM is no longer viewed as an isolated functional tool but as an integrated organizational capability. In particular, the growing emphasis on sustainable leadership and green innovation suggests that achieving sustainable performance requires alignment between HR systems, organizational strategy, and behavioral change mechanisms [2, 4].

From a theoretical perspective, this evolution reflects a transition from operational-level explanations toward a multi-level understanding that incorporates organizational capabilities, HR practices, and individual behavioral drivers. This finding extends prior reviews by highlighting the increasing convergence of strategic management and behavioral perspectives in GHRM research [3].

5.2. Research Gaps and Future Directions

Despite these advancements, several important gaps remain. First, most existing studies rely on cross-sectional and single-level designs, limiting causal inference and failing to capture the dynamic and multi-level nature of GHRM–performance relationships. Second, empirical evidence from high-emission and resource-intensive industries remains limited, restricting the generalizability of findings across different contexts. Third, the underlying mechanisms through which GHRM influences sustainable performance are still insufficiently explored, particularly with respect to mediating and moderating variables [3, 9].

Moreover, the integration of GHRM with broader climate and carbon management agendas remains underdeveloped. While sustainability is widely discussed, few studies explicitly link GHRM to carbon-related outcomes or climate transition strategies. This gap suggests the need for more context-sensitive and policy-relevant research that aligns HR practices with global sustainability challenges.

Addressing these gaps requires future research to adopt longitudinal and multi-level approaches, expand sectoral coverage, and develop integrative theoretical models that combine organizational, behavioral, and environmental perspectives. Such efforts would significantly enhance both the explanatory power and practical relevance of GHRM research.

5.3. Implications for Practice

From a practical perspective, the findings suggest that organizations should strategically align HR practices with sustainability objectives by fostering employee engagement, strengthening leadership commitment, and promoting green innovation. This alignment is particularly critical for energy-intensive industries facing increasing environmental and regulatory pressures.

Embedding sustainability into HR systems not only enhances pro-environmental behavior but also supports the development of organizational capabilities necessary for long-term performance. This implication is consistent with prior studies emphasizing the role of GHRM in shaping green organizational culture and improving environmental outcomes [2, 17].

Overall, this study advances GHRM literature by integrating multiple theoretical perspectives into a unified multi-level framework, linking organizational capabilities (RBV and EOT), HR mechanisms (AMO), and behavioral drivers (SCT and NAM). This integrative approach provides a more comprehensive explanation of how GHRM influences sustainable performance beyond isolated or single-theory perspectives.

6. CONCLUSION AND IMPLICATIONS

This study offers a comprehensive bibliometric and systematic review of Green Human Resource Management (GHRM) research over the period 2010-2025, based on a final sample of 196 peer-reviewed articles selected from Scopus. The analysis reveals a shift from compliance- and operations-focused approaches to strategic, behavioral, and leadership-driven perspectives. Three dominant research clusters were identified: (1) GHRM practices and sustainability outcomes; (2) enabling roles of leadership, CSR, and organizational support; and (3) green innovation and low-carbon transition.

The findings contribute to theory by integrating five key perspectives—the Resource-Based View (RBV), Ability-Motivation-Opportunity (AMO) framework, Social Cognitive Theory (SCT), Norm Activation Model (NAM), and Environmental Orientation Theory (EOT) into a multi-level framework. This framework captures how GHRM fosters green capabilities, drives employee behavior, and enables organizational sustainability through mediating (e.g., Green CSR) and moderating (e.g., sustainable leadership) pathways.

From a managerial and policy standpoint, the study underscores the importance of embedding GHRM in energy-intensive industries such as steel. Green HRM can accelerate industrial decarbonization by nurturing environmental commitment, innovation, and participation among employees. In the context of global sustainability frameworks (e.g., CBAM, EU Green Deal), integrating HR strategies with environmental innovation becomes a competitive necessity.

Despite its strengths, this review is limited by its reliance on Scopus-indexed English-language publications and bibliometric methodology. Future research should explore underrepresented contexts (e.g., developing countries, SMEs), adopt longitudinal and mixed methods approaches, and deepen examination of digital and cultural enablers of GHRM.

In conclusion, GHRM has evolved into a central pillar of sustainable enterprise transformation. Advancing this field requires both rigorous theoretical integration and context-sensitive application particularly in carbon-intensive sectors striving toward net-zero transitions.

This integrative approach not only enhances theoretical clarity but also extends existing research beyond descriptive bibliometric analysis toward a more explanatory and theory-driven understanding of the GHRM–sustainable performance relationship.

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