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## **Sustainable Human Resource Management, Green Human Resource Management, and Environmental Human Resource Management: Analysis of New and Emerging Terms Related to the Human Resource Area**

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### **ABSTRACT**

**Purpose:** Sustainable Human Resource Management (S-HRM), Green Human Resource Management (GHRM), and Environmental Human Resource Management (Environmental HRM) are terms that have been increasingly used in the field of human resources. This article aims to analyse how these terms are being used in the literature to identify if there are conceptual differences between them.

**Methodology/Approach:** The study was based on analysing publications on the subject indexed in the Web of Science, covering 543 articles. Clustering techniques based on co-citation and co-occurrence of keywords were used to verify the existence or absence of distinct groupings that differentiated these terms.

**Findings:** The results indicate the existence of well-defined Clusters concerning co-citation. The analysis of the co-occurrence networks of keywords also suggests the existence of specificities regarding the use of the terms S-HRM and GHRM.

**Research Limitation/Implication:** The research was limited to the database analysed, and it was suggested that the sample be expanded with other databases.

**Originality/Value of paper:** this study can contribute to advancing discussions on the subject, which is relevant for standardising concepts among researchers and practitioners who work in the area.

**Category:** Literature review

**Keywords:** S-HRM; GHRM; Environmental HRM; Green sustainability

**Research Areas:** Quality by Sustainability

## 1 INTRODUCTION

The importance of human resource management (HRM) for promoting sustainability and strategy development in organisations has been increasingly recognised by managers, academia, and society. It is a new approach in which HRM began to play a strategic role in promoting a more sustainable culture aligned with corporate social responsibility and the achievement of the United Nations (UN) Sustainable Development Goals (SDGs) (Barbosa et al., 2020; Zhykharieva et al., 2021; Khaskhely et al., 2022; Zacher, Rudolph and Katz, 2023). Despite the challenges and opportunities around the environmental problems discussed in recent decades, academia and human resource managers were slow to take ownership of this issue Jackson et al. (2011). Although the term Sustainable HRM appeared just over twenty years ago, from the 2010s onwards, this approach began to arouse more significant interest in the practice of organisations and research on the subject (Aust, Matthews and Muller-Camen, 2020; Hosseini et al., 2022; Napathorn, 2022).

Currently, the HRM area is experiencing the transition to this new paradigm that emerged in response to global and business environmental changes. Among other factors, greater environmental awareness, incorporating the concept of corporate social responsibility, and the Triple Bottom Line approach (TBL) pressured organisations to review their values, objectives, strategies, policies, and procedures. Such changes had repercussions in the human resources area, which also had to adapt to new demands to contribute to making organisations more sustainable (Westerman et al., 2020; Espuny et al., 2022; Rocha et al., 2022; Jia et al., 2023). In addition to Sustainable Human Resource Management (S-HRM), the literature presents other related terms, such as Green Human Resource Management (GHRM) and Environmental Human Resource Management (Environmental HRM). All three of these terminologies have in common the incorporation of concern for sustainability in the context of HRM (Cao, Yan and Teng, 2023; El Baroudi et al., 2023; Maskuroh et al., 2023).

The intersection between sustainability and human resource management can be analysed from two perspectives: the role of human resource management in promoting organisational sustainability and the sustainability of human resource management processes. Therefore, each perspective will have different research objectives. In addition to different perspectives within each approach, the concepts of S-HRM, GHRM, and Environmental HRM are not yet consolidated in the literature, which increases the complexity of an analysis of the studies that have been conducted on this topic (Macke and Genari, 2019; Ibrahim, Hami and Abdulameer, 2020). As they are concepts still under construction, which are very close to each other when addressing the same theme, and with a scientific community in formation (Ren, Tang and E. Jackson, 2018; Aust, Matthews and Muller-Camen, 2020; Barbosa et al., 2022; Cosenza, Santos and Barbosa, 2023), the following questions arise: how have these terms been applied? Have they been

used differently? Are there specifics related to these terms? Given the absence of more consolidated definitions of S-HRM, GHRM, and Environmental HRM, this study aims to analyse how these terms have been applied, using Clustering techniques that allow the identification of similarity patterns between publications. This Clustering was performed based on constructing a co-citation network, which has been widely used in science mapping studies (Chang, Huang and Lin, 2015; Singh et al., 2020). Co-occurrence networks of keywords were built within each identified Cluster to deepen the analysis.

It is essential to consider that the consolidation of a field of research demands the formation of a scientific community that, through a process of socialisation of knowledge, builds the fundamentals of research practice and shares a set of generalisations, methods, beliefs, values, and historical contexts that lead to a convergence of concepts and judgments (Ambardekar et al., 2023; Falloon, 2023). Therefore, it is necessary that practitioners and scholars who work with HRM practices focused on sustainability share the same understanding and are clear about the meaning of each of these terms: S-HRHM, GHRM, and Environmental HRM. It should be added that the absence of a more precise definition also hinders the development of metrics that allow evaluation of the results of actions and policies associated with their implementation (Tang et al., 2018). Therefore, the results of this study can contribute to a better understanding of the terminology that is being used in the literature and subsidise discussions around a better definition and maturation of these concepts by the community that works with this theme.

## 2 THEORETICAL FRAMEWORK

The origin of human resource management (HRM) originated at the beginning of the 20th century when the so-called General Theory of Administration emerged as a product of the human relations movement (Olexová and Gajdoš, 2016; Obedgiu, 2017; Rodrigues et al., 2019). For a long time, HRM was restricted to a view of the personnel department with a focus on traditional operations and practices in the human resources area, aiming at business profitability and meeting legal requirements (Freitas, Jabbour and Santos, 2011). The perception that HRM is strategic and needs to be aligned and contribute to achieving organisational objectives intensified in the late 1970s and early 1980s when the term Strategic Human Resource Management (SHRM) emerged (Kramar, 2014). SHRM constitutes an advance concerning traditional HRM, reinforcing the recognition that organisations are dynamic and that HRM policies and practices need to be contextualised and adapted to changes in the external and internal environments, considering their interrelationships with other elements of the organisation itself (Ren, Tang and E. Jackson, 2018; Hao, Liu and Goh, 2021; Soltanmohammadi et al., 2021).

In a historical trajectory, Sustainable HRM emerges as a step forward from Strategic Human Resource Management (Kramar, 2014; Ehnert et al., 2016;

Hronová and Špaček, 2021), incorporating new perspectives and challenges for human resource management. Sustainable HRM also represents a step forward from the two HRM models widely discussed since the 1980s: the so-called hard model and soft model of HRM. The hard model was conceived from Theory X by adopting rigid strategic controls. In this hard model, the function of the HRM is to contribute to the firm's economic performance within a unidimensional perspective aiming at the return for shareholders. In turn, the soft model was based on Theory Y with a conception of performance achieved from employee commitment. It is a more humanistic and developmental approach. Despite also incorporating the employee dimension, the focus of the HRM soft model continued to be organisational performance and shareholder value (Truss et al., 1997; Aust, Matthews and Muller-Camen, 2020).

With a broad conception, Sustainable HRM presents a multidimensional perspective covering: (i) multiple stakeholders; (ii) focus on economic, social and environmental goals; (iii) impacts inside and outside organisations; and (iv) long-term horizon considering human resource development, regeneration, and renewal (Ehnert et al., 2016; Stankevičiūtė and Savanevičienė, 2018; Westerman et al., 2020). However, the concept of S-HRM is still being discussed in the literature. Researchers highlight that more rigorous research on the subject is needed to better understand this new field of research (Randev and Jha, 2019; Anlesinya and Susomrith, 2020). Academic opinions about what S-HRM means are still unclear (Kramar, 2014; Aust, Matthews and Muller-Camen, 2020), which reinforces the need for a more precise conceptual definition. Several definitions of Sustainable GHR can be consulted in Bombiak, (2020), Macke and Genari (2019).

Kramar (2014) categorises the literature on sustainable HRM into three groups: (i) studies that focus on the internal impacts of HRM policies, emphasising economic outcomes and sustainable competitive advantage; (ii) studies that emphasise external results, which result from broader performances, including ecological/environmental and/or social and human results; and (iii) studies that go beyond HRM practices and analyse the interrelationships between management practices and organisational results, including environmental and social results. These three groups have in common the fact that they consider sustainability from a long-term perspective.

In turn, Randev and Jha, (2019) say that the literature on S-HRM can be classified into four non-exclusive approaches, also focusing on results: (i) the economic orientation of HRM; (ii) GRH's social orientation; (iii) GRH's environmental guidance; and (iv) employee guidance. The economic orientation of HRM refers to the first group, as pointed out by Kramar (2014), with a focus on financial goals and seeking a sustainable competitive advantage for the company. GRH's social orientation incorporates concern for external results in alignment with corporate social responsibility (CSR) and the Triple Bottom Line. The environmental orientation focuses on environmental sustainability through HRM practices. According to the authors, this approach focuses on environmental orientation and was greatly inspired by the literature on GHRM. Studies focused on employees,

on the other hand, focus on the needs and requirements of employees and discuss the implications of current HRM practices, having been inspired by the literature on sustainable work systems. This approach seeks to minimise the damage caused by work in employees' lives, seeking to provide greater physical and psychosocial well-being.

Aiming at a better organisation of knowledge on the subject, Aust et al. (2020) also pointed out four types of S-HRM: (i) Socially Responsible HRM, whose organisational perspective is inside-out, combining social and economic purposes; (ii) Green HRM, whose organisational perspective is inside-out, combining environmental and economic purposes; (iii) Triple Bottom Line HRM, whose organisational perspective is inside-out, combining economic, environmental and social purposes; and (iv) Common Good HRM, whose perspective is outside-in considering that the use of skills, abilities, attitudes, and knowledge of human resource management to promote common good values and contribute to the solution of major global challenges. Therefore, for Aust et al. (2020), GHRM is identified as a type of S-HRM.

In turn, Paulet et al. (2021) mention that GHRM studies have emerged as a growing field of conceptual and empirical work, both within and separate from the broader topic of S-HRM. Therefore, as can be seen, the relationship between GHRM and S-HRM is not yet well-established in the literature. While some researchers point to GHRM as a subfield of S-GHRM, others present it as an independent field of study. Concerning GHRM, this term began to spread in the 2010s (Santana, Morales-Sánchez and Pasamar, 2020), originating from organisations that sought to integrate sustainability into their internal activities and decision-making (Ren, Tang and E. Jackson, 2018; Santos et al., 2014). GHRM adopts the premise that the success of organisational initiatives for environmental sustainability depends on the behavior of employees (employees and other employees) who must have a pro-environmental attitude, which involves adopting human resources practices aligned with this purpose (Santos and Barbosa, 2006; Saeed et al., 2019; Sá et al., 2019; Zgodavova et al., 2020; Doiro et al., 2017; Santos et al., 2017; Jimenez et al. 2019; Fonseca et al., 2022).

Therefore, several studies on GHRM have addressed the green practices that must be present in all traditional processes in the human resources area: recruitment and selection; training and development; empowerment or involvement; performance evaluation; and payment and rewards (Jabbour, Santos and Nagano, 2010; Mishra, 2017; Ren, Tang and E. Jackson, 2018; Saeed et al., 2019). Each of these processes must be conceived, planned, and executed in alignment with the sustainable objectives of the organisations (Jabbour, Santos and Nagano, 2010). Bombiak and Marciniuk-Kluska (2018) reinforce that GHRM plays a significant role in developing environmentally friendly practices within organisations. Masri and Jaaron (2017) also align with this definition when they state that GHRM consists of using "Human Resource Management practices to reinforce environmentally sustainable practices and increase employee's commitment to the issues of environmental sustainability".

From a broader perspective, Opatha and Arulrajah (2014) say that GHRM encompasses policies, practices, and systems that aim to make the organisation's employees "green," which ends up reflecting and benefiting individuals, organisations, society, and the environment. Like S-HRM, there are also several definitions of GHRM in the literature, which can be found in Amrutha and Geetha (2020) and in Table 1. Given the diversity of approaches and definitions, Ren et al. (2018) warn that the theoretical foundations of GHRM are still poorly specified and highlight the urgent need to define a conceptualisation and more precise measurements concerning GHRM.

Environmental HRM is the least used in the literature among the three terms mentioned above. Only some studies use this terminology. It should be added that this term has also been used as a kind of synonym for GHRM (Leidner, Baden and Ashleigh, 2019; Yong, Yusliza and Fawehinmi, 2019), which can be explained due to the strong relationship between GHRM and Environmental Management (EM) (Ren, Tang and Jackson, 2018). This association between the terms GHRM and Environmental HRM may have resulted from two seminal publications on GHRM (Jackson et al., 2011; Renwick, Redman and Maguire, 2013) that sought to integrate the themes of environmental management and human resources management.

However, in the literature, different positions are also found in this regard. Schoemaker (2019) says that some definitions of GHRM are broader, suggesting that it is not restricted only to EM. In this line, the author cites the definitions given by Opatha and Arulrajah (2014) and Deshwal (2015) (see Table 1) that do not specifically mention the relationship with EM. Another point of divergence pointed out by Schoemaker (2019) refers to the conception that GHRM has a restricted focus on environmental issues. This conception contrasts with authors such as Ahmad (2015), for whom the social and economic well-being of the employee and the organisation should also be part of GHRM. Still, according to Schoemaker (2019), although most definitions of GHRM are focused mainly on environmental aspects, this conception has been changing over time.

Reinforcing the different approaches, Ren et al. (2018) say that two schools of thought deal with the conceptualisations of "GHRM vis-à-vis EM." In the first school, GHRM is effectively treated as an aspect of HRM within EM. Research related to this conceptualisation focuses primarily on understanding the adoption and potential benefits of one or more specific HRM practices, such as functions of recruiting, performance management, training and development, and compensation. In the second school, the concept is expanded to recognise that GHRM also promotes changes in employees' attitudes and behaviour, improving the company's environmental performance. Thus, the individual and collective capacities that result in green behaviour, commitment, and motivation began to be incorporated in studies within this broader perspective of GHRM.

*Table 1 – Examples of S-HRM, GHRM and Environmental HRM definitions*

Term	Definition
S-HRM	<p>Mariappanadar (2003): Sustainable HR strategy for managing involves meeting the current needs of both the company and the community while ensuring the ability to meet future needs without compromising.</p> <p>Ehnert et al. (2016): A HRM refers to the deliberate or evolving strategies and practices aimed at achieving organisational goals while ensuring the long-term reproduction and control of the HR base and mitigating any self-induced side effects or feedback on the HR systems, as well as on the company.</p> <p>Cohen et al. (2012): The implementation of HR tools to integrate a sustainability strategy within the organisation and the establishment of an HRM system that supports the firm's sustainable performance characterises sustainable human resource management. Sustainable HRM fosters the development of skills, motivation, values, and trust necessary to achieve a triple bottom line, while promoting the long-term health and sustainability of both internal and external stakeholders through equitable, developmental, and well-being policies that facilitate environmentally friendly practices.</p> <p>Kramar (2014): The definition of SHRM involves the deliberate or evolving HR strategies and practices aimed at achieving financial, social, and ecological goals, while ensuring the long-term reproduction of the HR base. It also aims to reduce the adverse impacts on the natural environment, people, and communities. SHRM recognises the vital role of CEOs, middle and line managers, HR professionals, and employees in providing consistent and consensual messages that are distinctive and enable effective decision-making.</p> <p>Ehnert et al. (2016): The definition of sustainable HRM involves implementing HRM strategies and practices that facilitate the attainment of financial, social, and ecological objectives, with effects both within and outside the organisation and with a long-term perspective, while managing unintended side effects and negative feedback.</p> <p>Kramar (2022): The objective of sustainable HRM is to obtain therapeutic, social, human, and environmental results simultaneously, focusing on short- and long-term objectives.</p>
GHRM	<p>Opatha and Arulrajah (2014): It pertains to the policies, practices, and systems that promote environmentally conscious behaviours among employees, leading to benefits for the individual, society, natural environment, and business.</p> <p>Sharma and Gupta (2015): The utilisation of HRM policies to encourage the responsible utilisation of resources in business organisations and beyond supports the objectives of environmental sustainability. This encompasses human resource programs that advocate sustainable practices and enhance employee awareness and commitment towards sustainability issues.</p> <p>Deshwal (2015): The implementation of HRM policies that facilitate the responsible consumption of resources within organisations and, more broadly, advances the goals of environmental sustainability.</p> <p>Masri and Jaaron (2017): Green Human Resource Management (GHRM) involves the utilisation of Human Resource Management practices to promote environmental sustainability practices and enhance employee dedication to sustainability issues.</p>

Term	Definition
	<p>Ren et al. (2018): GHRM may be described as a concept that sheds light on the connections between organisational actions that affect the natural environment and the development, implementation, and effects of HRM systems.</p> <p>Molina-Azorin et al. (2021): HRM encompasses all HR practices, while GHRM specifically incorporates environmental concerns into HR practices.</p>
Environmental HRM	<p>Young et al. (2019): for the authors, Environmental HRM has the same meaning as GHRM - "Green or environmental human resource management".</p> <p>Leidner et al. (2019): the author also attribute the same meaning for the two terms - "Green (environmental) Human Resource Management".</p> <p>Alreahi et al. (2022): the authors state that the GHRM is known as "environmental" human resource management, considered essential for the implementation of a sustainable development strategy in organisations.</p>

### 3 RESEARCH METHOD

The nature of this work is classified as applied since it has a practical interest, and the results can be used in the solution of real everyday problems. The objectives of this research are classified as descriptive and exploratory. Descriptive because it allows the description of the characteristics of the phenomenon observed, and exploratory because it will provide greater familiarity with the problem, explaining it through analysis, classification, and interpretation. As for the approach to the problem, the qualitative method was used because it has an exploratory character and allows the understanding of a phenomenon and the contribution to its change. Regarding the research procedures, the bibliometric analysis was used (Kothari and Garg, 2019; Redante et al., 2019; Barbosa et al., 2020; Franco et al., 2022).

The present study uses Clustering techniques to identify how the concepts of S-HRM, GHRM, and Environmental HRM have been used in the literature. It starts from the premise that Clusters gathering publications around each specific term would indicate that each of these terms has been used similarly and in a different way in relation to the other terms. This Clustering was done through the construction of a co-citation network. Co-occurrence networks of keywords were built within each identified Cluster to deepen the analysis. The study was developed in two main stages: (a) survey of publications on S-HRM, GHRM, and Environmental HRM; and (b) identification of Clusters and construction of networks of co-citation and co-occurrence of keywords.

#### 3.1 Selection of Publications

The procedure involved a search for articles in the Web of Science database with the following query in the topic field: "Green HR\*" OR "Green Human Resource\*" OR GHRM OR "Sustainable Human Resource\*" OR "Sustainable HR\*" OR "Environmental Human Resource\*" OR "Environmental HR\*". The search was limited to records until 2021, with 543 papers found. Table 2 shows the number of

papers related to each keyword in the search query. The union of the records obtained by the keywords "Green HR\*" OR "Green Human Resource\*" OR GHRM forms the group of articles that uses the concept "Green Human Resource Management." The union of the records obtained by the keywords ("Sustainable Human Resource\*" OR "Sustainable HR\*") forms the group of articles that uses the "Sustainable Human Resource Management" concept.

Table 2 – Record number by query keyword

Keyword	Records
Green Human Resource*	281
GHRM	150
Sustainable Human Resource*	147
Green HR*	140
Sustainable HR*	116
Environmental HR*	15
Environmental Human Resource*	2

The distribution of publications according to the terms used can be seen in Figure 1.

A total of 507 publications referred exclusively to a single term, with emphasis on GHRM (301), followed by S-HRM (183) and Environmental HRM (23). Only one publication made references to the three terms, while 35 mentioned two terms.

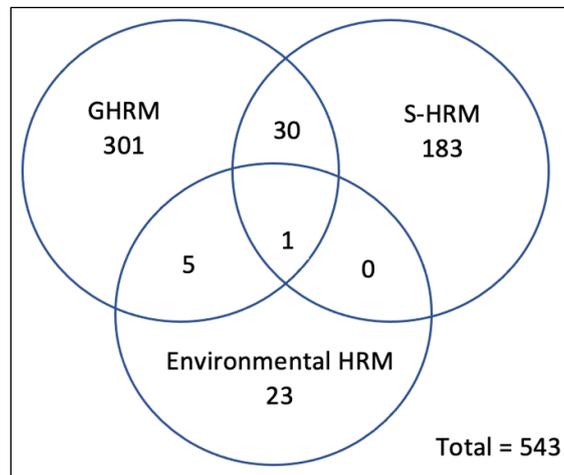


Figure 1 – Distribution of publications according to the terms

Figure 1 shows that the term GHRM has been used more in the literature when compared to two other terms. This result reinforces that GHRM has emerged as a growing field of studies (Paulet et al., 2021), either as an approach within the S-HRM concept (Aust et al., 2020) or as an independent approach (Paulet et al., 2021). In turn, as mentioned in section 2 (Table 1), the term Environmental HRM is the least used, sometimes being associated as a kind of synonym for GHRM, which is the term that has prevailed in the literature.

Considering that the number of publications on Environmental HRM has been reduced and the term Environmental HRM has sometimes been used with the same meaning as GHRM, the analysis of results focused mainly on the terms S-HRM and GHRM.

### **3.2 Clusters and Networks of Co-Citation and Co-Occurrence of Keywords**

Co-citation analysis is an essential technique in science mapping studies (Braam and Peeters, 2018). It allows measuring the degree of relationship or association between papers, considering the perceptions of the authors citing the articles. Strong co-citation links indicate the similarity of subject matter (Small, 1973). Today, co-citation analysis is used to investigate the structure of research collaboration (Chen, Zhang and Fu, 2019), discover the journals that formed the intellectual base of a knowledge domain (Hu et al., 2018), to predict knowledge flows (Smojver, Štorga and Zovak, 2021), or to identify emerging trends (Liu, Jiang and Ma, 2013; Ruan et al., 2019).

Co-citations are used in several areas such as Transport Geography (Liu and Gui, 2016), Nursing (Chang et al., 2021), Sustainability (Hu et al., 2018), Social Entrepreneurship (Tan Luc et al., 2022), Human Resource Management (Fang, 2019), Agriculture (Ruan et al., 2019), Manufactures (Jin et al., 2017), Tourism (Pestana, Sánchez and Moutinho, 2019), and Medicine (Chen et al., 2012; Ma et al., 2019).

The vertices were the papers used to build the co-citation network. The edges connected two vertices if the papers cited at least one paper in common. The Louvain algorithm (Blondel et al., 2008) was applied to the network to identify Clusters and compared the Clusters with the keywords related to each paper.

Two software were used at this stage of the study: Pajek and VOSviewer. Pajek is a software dedicated to Social Network Analysis and was used to build the co-citation network and identify publication Clusters. In turn, VOSviewer was used to elaborate the networks and Clusters of co-occurrences of keywords.

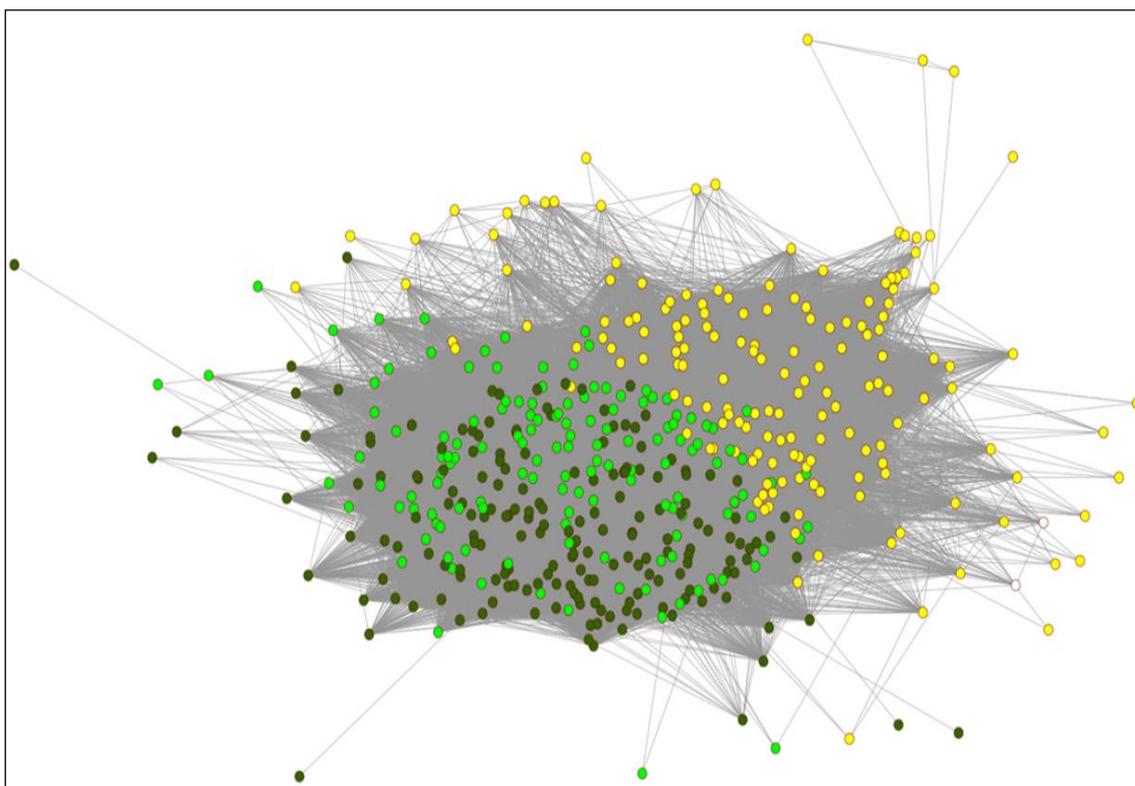
A Table with the percentage of publications containing specific terms in their corpus (Table 4) was created to complement the analysis and allow a better comparison between the three Clusters analysed.

## **4 RESULTS AND DISCUSSIONS**

This section presents the results of the study. First, the co-citation network is shown, along with the identification of the Clusters. Next, the co-occurrence networks of keywords referring to each Cluster are identified.

#### 4.1 Identification of Clusters

The co-citation network of the 543 articles analysed in this study is shown in Figure 2. As can be seen, three Clusters were identified. Each cluster listed in Table 3 is identified by a colour (yellow = cluster 1; light green = cluster 2; dark green = cluster 3). The vertices represent the articles that make up each cluster. The edges connecting the two vertices indicate that these articles cited at least one publication in common. For example: if article A cites publication X and article B also cites publication X, then there will be an edge connecting article A to article B. Each of these Clusters is formed by publications that have similarities to each other based on co-citation.



*Figure 2 – Network Clusters co-citation*

*Legend: Yellow = cluster 1; light green = cluster 2; dark green = cluster 3*

The analysis of the results focused on the two terms: S-HRM and GHRM as described in the methodology. After identifying the Clusters of the co-citation network, the composition of each of the three Clusters was verified in relation to the number of publications with keywords referring to the terms Green and Sustainable (Table 3).

Table 3 – Clusters composition

Cluster	Green	Sustainable	Green (%)	Sustainable (%)	Total
1	19	148	11.5	89.7	165
2	167	21	89.8	11.3	186
3	131	15	94.2	10.8	139

As observed in Table 3 and Figure 3, Cluster 1 is mostly formed by publications with keywords referring to the term sustainable (89.7% of publications in this Cluster). In turn, Clusters 2 and 3 group mainly publications with keywords with the term Green (respectively, 89.8% and 94.2% of publications in each Cluster). This may be an indication that in the literature on the subject, the terms S-HRM and GHRM have been used differently.

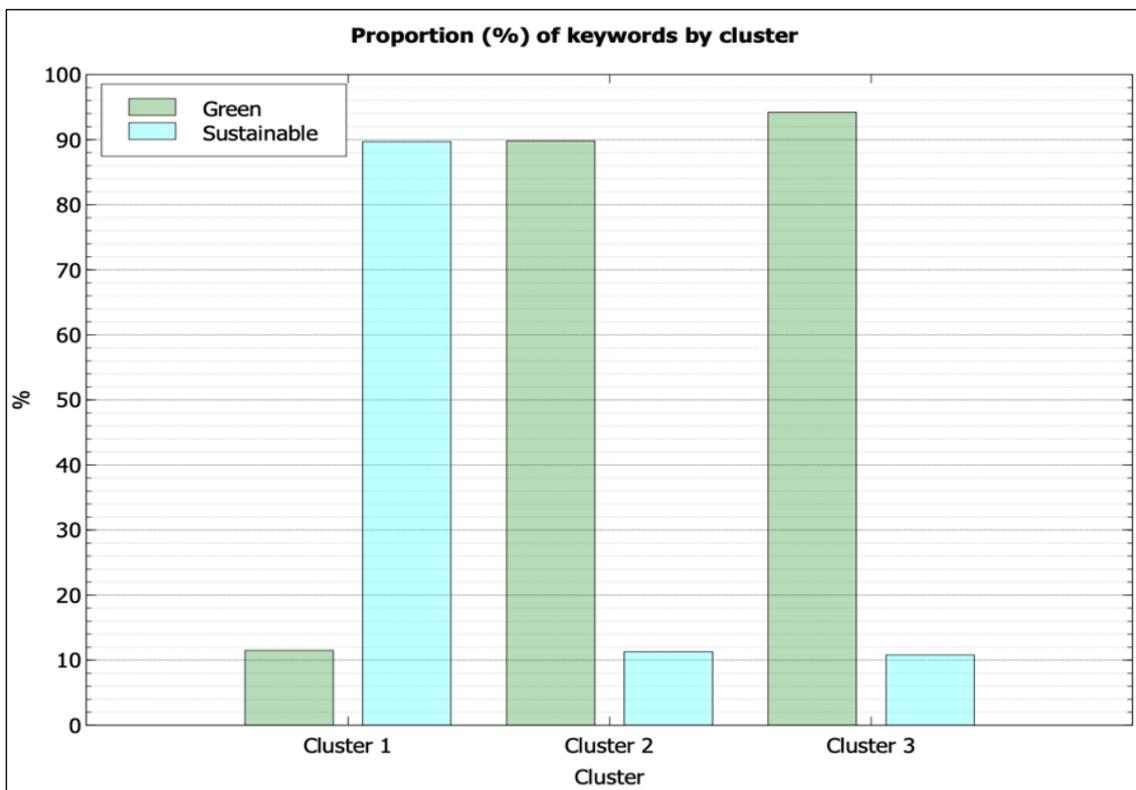


Figure 3 – Clusters composition (Green X Sustainable)

Figure 4 shows the evolution of publications for each Cluster over time. The Cluster with the term Sustainable (Cluster 1) has older publications, indicating that it is a previous approach, corroborating what is pointed out in the literature. In turn, publications with the term Green (Cluster 2 and 3) are more recent.

It is observed that it was from 2010 onwards that there was a significant growth in publications on this topic, both in relation to S-HRM and GRHM. It is also observed that, although S-HRM is a term with a broader approach, publications focusing on GHRM have predominated in the literature. Publications referring to

Cluster 3 had a sharp growth from 2018, standing out when compared to the other two Clusters.

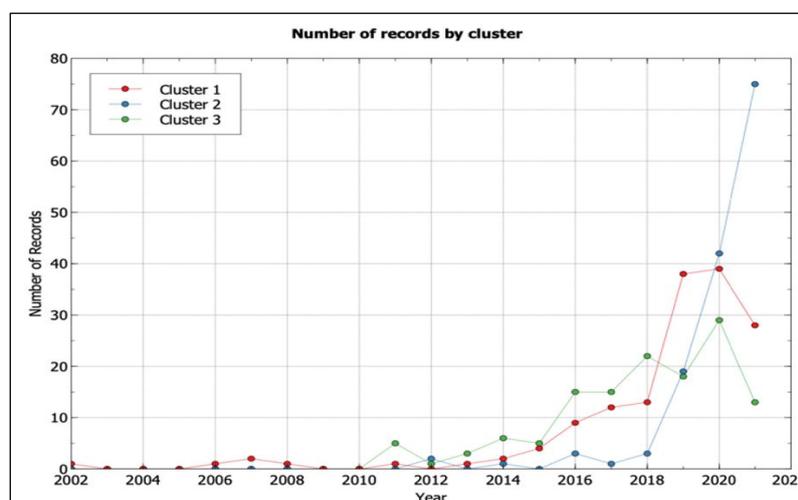


Figure 4 – Evolution of publications by Cluster

## 4.2 Cluster Analysis

Three networks based on the co-occurrence of keywords were created for a better analysis of the similarities that bring together the publications of each Cluster. In each of these networks, new Clusters were identified according to the subjects addressed in the publications, as shown in Figures 5, 6 and 7. Table 4 is presented below, containing the percentage of some terms found in the publications of each Cluster to allow a better analysis of the results.





Terms/words	Cluster 1 %	Cluster 2 %	Cluster 3 %
Social responsibility	13.3	7.5	8.6
Leadership	9.7	18.8	6.5

The comparison between Figures 5, 6 and 7 shows a difference between the keywords co-occurrence network of Cluster 1 (related to S-RHM) and the networks of Clusters 2 and 3 (related to GHRM). The Cluster 1 network does not show many terms related to specific HRM practices. Only “sustainable hr practice” appears, which refers to a broader set of practices. In turn, the networks of Clusters 2 and 3 bring more terms related to specific and traditional practices in the HRM area. In these networks, it is possible to observe terms such as: “hr practice”; “green human resource practice”; “green recruitment”; “selection”; “green training”; “environmental training”; “performance management”; “green ability”; and “reward”. Considering these two networks (Clusters 2 and 3), the occurrence of traditional practices in the HRM area occurs even more intensely in the Cluster 3 network. The data in Table 4 reinforce this result with the term “practices” present in 46.6% of publications in Cluster 1, while in Clusters 2 and 3, this percentage rises to 61.8% and 77.0%, respectively. In Clusters 2 and 3, a higher frequency of terms such as “recruitment” or “selection”, “training”, and “benefits or rewards” can also be observed, which are directly associated with HRM practices.

Another characteristic observed is the absence of the term “environment” in the highlighted words in the network of Cluster 1, being present in the networks of Clusters 2 and 3. In the network of Cluster 2, the term “environment” appears related to “environmental knowledge”, “pro environmental behavior” and “environmental concern”. In the network of Cluster 3, the term also appears associated with “environmental knowledge” including “environmental management system” and “environmental training”. Table 4 shows the predominance of the term “environmental” in Clusters 2 and 3 (78.5% and 87.8% respectively), while in Cluster 1 this term appears in a much smaller percentage of publications (27.9%). This result may reflect the approximation between the concepts of Environmental Management and GHRM mentioned in the literature (Jackson et al., 2011; Renwick, Redman and Maguire, 2013; Molina-Azorin et al., 2021).

On the contrary, terms like “sustainability” or “sustainable” are more present in Cluster 1, which is expected due to the name S-RHM itself. The same happens with the terms “corporate” and “social responsibility”, which also appear more frequently in Cluster 1. The greater presence of these terms in Cluster 1 can be explained by the scope of the S-HRM concept, which encompasses several typologies (Kramar, 2014; Randev and Jha, 2019; Aust, Matthews and Muller-Camen, 2020) as described in the Background section.

“Performance” is another term that differentiates between Clusters. While this term is not evidenced in the network of Cluster 1, “performance management” is

observed in the networks of Clusters 2 and 3. According to Table 4, the terms “performance” or “evaluation” or “assessment” are much more present in Clusters 2 and 3 (52.7% and 52.5%, respectively) than in Cluster 1 (29.7%). This result may be an indication that the literature on GHRM has a greater focus on the application of evaluation metrics than the literature on S-HRM. The same happens with the term “behavior”, which is present in 45.7% and 25.2% of publications in Clusters 2 and 3 respectively, and 15.2% in publications in Cluster 1. In turn, there is no observed significant difference between the Clusters regarding the following terms: “motivation” or “satisfaction” or “engagement” or “commitment”. The same happens in relation to “employee”, with more than 50% of the publications in the three analysed Clusters.

It is interesting to note that Clusters 2 and 3 have a higher percentage of publications with “model” or “framework” (58.1% and 52.5% respectively) than Cluster 1 (42.4%). In relation to methodological aspects, the three Clusters present similar results regarding the terms “literature” or “review” (ranging from 38.2% to 43.9%). However, Clusters 2 and 3 stand out in relation to “questionnaire” or “interview” or “survey” with respectively 45.2% and 39.6% of the publications, while Cluster 1 is restricted to 26.6%.

## 5 CONCLUSION

This study sought to show how the concepts S-HRM, GHRM and Environmental HRM have been used in the literature, seeking to contribute to a better understanding of their meanings. The study did not intend to propose a concept for these terms but to point out if there are specificities and if they have been used differently. Based on the methodology adopted, the results suggest that the terms S-HRM and GHRM have specificities, with three distinct Clusters being identified: one focusing on publications on S-HRM and two focusing on publications on GHRM. The results of the comparison between these Clusters suggest that studies involving GHRM have focused more on specific RHM practices than studies on S-HRM. Likewise, the results also suggest that GHRM studies have addressed more performance-related issues than S-HRM studies.

The study was based on an analysis of co-citations and co-occurrence of keywords covering a total of 543 publications. That way, the results presented derive from these methodological choices. Thus, the article contributed to filling the gap pointed out in the literature on the subject, highlighting the importance of having more clarity about the meaning, scope, and limits of the concepts of S-HRM, GHRM and Environmental HRM. Therefore, the main contribution of this research is to identify the specificities and distinctive forms brought about by these new and emerging concepts. The results presented can provide support for future studies aimed at building a conceptual model capable of providing a better delimitation and definition of these terms, which is necessary for researchers and practitioners to be able to share the same understanding about the meaning of S-HRM, GHRM and Environmental HRM. They may also lead to the establishment of metrics that

allow for the evaluation and comparison of the various actions and policies implemented by organisations.

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## REFERENCES

Ahmad, S., 2015. Green Human Resource Management: Policies and practices. *Cogent Business & Management*, [online] 2(1), p.1030817. <https://doi.org/10.1080/23311975.2015.1030817>.

Alreahi, M., Bujdosó, Z., Kabil, M., Akaak, A., Benkó, K.F., Setioningtyas, W.P. and Dávid, L.D., 2022. Green Human Resources Management in the Hotel Industry: A Systematic Review. *Sustainability*, [online] 15(1), p.99. <https://doi.org/10.3390/su15010099>.

Ambardekar, A.P., Eriksen, W., Ferschl, M.B., McNaull, P.P., Cohen, I.T., Greeley, W.J. and Lockman, J.L., 2023. A Consensus-Driven Approach to Redesigning Graduate Medical Education: The Pediatric Anesthesiology Delphi Study. *Anesthesia & Analgesia*, [online] 136(3), pp.437–445. <https://doi.org/10.1213/ANE.0000000000006128>.

Amrutha, V.N. and Geetha, S.N., 2020. A systematic review on green human resource management: Implications for social sustainability. *Journal of Cleaner Production*, [online] 247, p.119131. <https://doi.org/10.1016/j.jclepro.2019.119131>.

Anlesinya, A. and Susomrith, P., 2020. Sustainable human resource management: a systematic review of a developing field. *Journal of Global Responsibility*, [online] 11(3), pp.295–324. <https://doi.org/10.1108/JGR-04-2019-0038>.

Aust, I., Matthews, B. and Muller-Camen, M., 2020. Common Good HRM: A paradigm shift in Sustainable HRM? *Human Resource Management Review*, [online] 30(3), p.100705. <https://doi.org/10.1016/j.hrmr.2019.100705>.

Barbosa, L.C.F.M., Mathias, M.A.S., Santos, G. and De Oliveira, O.J., 2020. How the Knowledge of the Major Researchers Is Forging the Business Strategy Paths: Trends and Forecasts from the State of the Art. *Quality Innovation Prosperity*, [online] 24(3), p.1. <https://doi.org/10.12776/qip.v24i3.1404>.

Barbosa, L.C.F.M., de Oliveira, O.J., Machado, M.C., Morais, A.C.T., Bozola, P.M. and Santos, G., 2022. Lessons learned from quality management system ISO 9001:2015 certification: practices and barrier identification from Brazilian industrial companies. *Benchmarking: An International Journal*, [online] 29(8), pp.2593–2614. <https://doi.org/10.1108/BIJ-07-2021-0382>.

Blondel, V.D., Guillaume, J.-L., Lambiotte, R. and Lefebvre, E., 2008. Fast unfolding of communities in large networks. *Journal of Statistical Mechanics: Theory and Experiment*, [online] 2008(10), p.P10008. <https://doi.org/10.1088/1742-5468/2008/10/P10008>.

Bombiak, E., 2020. Advances in the implementation of the model of sustainable human resource management: Polish companies' experiences. *Entrepreneurship and Sustainability Issues*, [online] 7(3), pp.1667–1687. [https://doi.org/10.9770/jesi.2020.7.3\(16\)](https://doi.org/10.9770/jesi.2020.7.3(16)).

Bombiak, E. and Marciniuk-Kluska, A., 2018. Green Human Resource Management as a Tool for the Sustainable Development of Enterprises: Polish Young Company Experience. *Sustainability*, [online] 10(6), p.1739. <https://doi.org/10.3390/su10061739>.

Braam, G. and Peeters, R., 2018. Corporate Sustainability Performance and Assurance on Sustainability Reports: Diffusion of Accounting Practices in the Realm of Sustainable Development. *Corporate Social Responsibility and Environmental Management*, [online] 25(2), pp.164–181. <https://doi.org/10.1002/csr.1447>.

Cao, Y., Yan, B. and Teng, Y., 2023. Making bad things less bad? Impact of green human resource management on counterproductive work behaviors of grassroots employees: Evidence from the hospitality industry. *Journal of Cleaner Production*, [online] 397, p.136610. <https://doi.org/10.1016/j.jclepro.2023.136610>.

Chang, C.-Y., Gau, M.-L., Tang, K.-Y. and Hwang, G.-J., 2021. Directions of the 100 most cited nursing student education research: A bibliometric and co-citation network analysis. *Nurse Education Today*, [online] 96, p.104645. <https://doi.org/10.1016/j.nedt.2020.104645>.

Chang, Y.-W., Huang, M.-H. and Lin, C.-W., 2015. Evolution of research subjects in library and information science based on keyword, bibliographical coupling, and co-citation analyses. *Scientometrics*, [online] 105(3), pp.2071–2087. <https://doi.org/10.1007/s11192-015-1762-8>.

Chen, C., Hu, Z., Liu, S. and Tseng, H., 2012. Emerging trends in regenerative medicine: a scientometric analysis in CiteSpace. *Expert Opinion on Biological Therapy*, [online] 12(5), pp.593–608. <https://doi.org/10.1517/14712598.2012.674507>.

Chen, K., Zhang, Y. and Fu, X., 2019. International research collaboration: An emerging domain of innovation studies? *Research Policy*, [online] 48(1), pp.149–168. <https://doi.org/10.1016/j.respol.2018.08.005>.

Cohen, E., Taylor, S. and Muller-Camen, M., 2012. *HRM's role in corporate social and environmental sustainability [SHRM Foundation's Effective Practice Guidelines Series]*. Alexandria: Society for Human Resource Management.

Cosenza, A.C., Santos, G. and Barbosa, L.C.F.M., 2023. Green Human Resource Management: The Performance of Women Researchers Based on Bibliometric Indicators. In: *Quality Innovation and Sustainability*. [online] Cham: Springer. pp.161–169. [https://doi.org/10.1007/978-3-031-12914-8\\_13](https://doi.org/10.1007/978-3-031-12914-8_13).

Deshwal, P., 2015. Green HRM: An organisational strategy of greening people. *International Journal of Applied Research*, 1(13), pp.176–181.

Doiro, M.; Fernández, J.F.; Félix, M.J.; Santos, G. 2017. ERP - machining centre integration: a modular kitchen production case study. *Procedia Manufacturing* 13, 1159-1166. <https://doi.org/10.1016/j.promfg.2017.09.178>

Ehnert, I., Parsa, S., Roper, I., Wagner, M. and Muller-Camen, M., 2016. Reporting on sustainability and HRM: a comparative study of sustainability reporting practices by the world's largest companies. *The International Journal of Human Resource Management*, [online] 27(1), pp.88–108. <https://doi.org/10.1080/09585192.2015.1024157>.

El Baroudi, S., Cai, W., Khapova, S.N. and Jiang, Y., 2023. Green human resource management and team performance in hotels: The role of green team behaviors. *International Journal of Hospitality Management*, [online] 110, p.103436. <https://doi.org/10.1016/j.ijhm.2023.103436>.

Espuny, M., Costa, A.C.F., Reis, J.S. da M., Barbosa, L.C.F.M., Carvalho, R., Santos, G. and Oliveira, O.J. de, 2022. Identification of the Elements and Systematisation of the Pillars of Solid Waste Management. *Quality Innovation Prosperity*, [online] 26(2), pp.147–169. <https://doi.org/10.12776/qip.v26i2.1717>.

Falloon, G., 2023. Twelve years of iPads and apps in schools: What conditions support effective practices in K-6 classrooms? *Frontiers in Education*, [online] 8. <https://doi.org/10.3389/educ.2023.1122522>.

Fang, Y.-S., 2019. Mapping the Knowledge Evolution of Human Resources Management: A Co-Citation Analysis of 1990–1999 Research Documents. In: *Proceedings of the 2019 International Conference on Economic Management and Cultural Industry (ICEMCI 2019)*. [online] Paris, France, France: Atlantis Press. <https://doi.org/10.2991/aebmr.k.191217.048>.

Fonseca, L., Silva, V., Sá, J.C., Lima, V., Santos, G., Silva, R. 2022. B Corp versus ISO 9001 and 14001 certifications: Aligned, or alternative paths, towards sustainable development? *Corp Soc Responsib Environ Manag.* 29, 496–508. <https://doi.org/10.1002/csr.2214>

Franco, J. de A.B., Espuny, M., Reis, J.S. da M., Diogo, G.M.M., Nunhes, T.V., Barbosa, L.C.F.M., Costa, A.C.F., Paes, L.A.B., Rodrigues, A.M., Battistelle, R.A.G. and Oliveira, O.J. de, 2022. Digital Transformation in School Management: The Legacy that Strategic Actions in the 2020s Leave for Future Pandemics. *Gestão & Produção*, [online] 29(1), pp.1–22. <https://doi.org/10.1590/1806-9649-2022v29e622>.

- Hao, Z., Liu, C. and Goh, M., 2021. Determining the effects of lean production and servitisation of manufacturing on sustainable performance. *Sustainable Production and Consumption*, [online] 25, pp.374–389. <https://doi.org/10.1016/j.spc.2020.11.018>.
- Hosseini, S.A., Moghaddam, A., Damganian, H. and Shafiei Nikabadi, M., 2022. The Effect of Perceived Corporate Social Responsibility and Sustainable Human Resources on Employee Engagement with the Moderating Role of the Employer Brand. *Employee Responsibilities and Rights Journal*, [online] 34(2), pp.101–121. <https://doi.org/10.1007/s10672-021-09376-0>.
- Hronová, Š. and Špaček, M., 2021. Sustainable HRM Practices in Corporate Reporting. *Economies*, [online] 9(2), p.75. <https://doi.org/10.3390/economies9020075>.
- Hu, F., Liu, W., Tsai, S.-B., Gao, J., Bin, N. and Chen, Q., 2018. An Empirical Study on Visualising the Intellectual Structure and Hotspots of Big Data Research from a Sustainable Perspective. *Sustainability*, [online] 10(3), p.667. <https://doi.org/10.3390/su10030667>.
- Ibrahim, Y.M., Hami, N. and Abdulameer, S.S., 2020. A Scale for Measuring Sustainable Manufacturing Practices and Sustainability Performance: Validity and Reliability. *Quality Innovation Prosperity*, [online] 24(2), p.59. <https://doi.org/10.12776/qip.v24i2.1385>.
- Jabbour, C.J.C., Santos, F.C.A. and Nagano, M.S., 2010. Contributions of HRM throughout the stages of environmental management: methodological triangulation applied to companies in Brazil. *The International Journal of Human Resource Management*, [online] 21(7), pp.1049–1089. <https://doi.org/10.1080/09585191003783512>.
- Jackson, S.E., Renwick, D.W.S., Jabbour, C.J.C. and Muller-Camen, M., 2011. State-of-the-Art and Future Directions for Green Human Resource Management: Introduction to the Special Issue. *German Journal of Human Resource Management: Zeitschrift für Personalforschung*, [online] 25(2), pp.99–116. <https://doi.org/10.1177/239700221102500203>.
- Jia, J., Yuan, S., Wei, L. and Tang, G., 2023. When firms adopt sustainable human resource management: A fuzzy-set analysis. *Human Resource Management*, [online] 62(3), pp.283–305. <https://doi.org/10.1002/hrm.22164>.
- Jimenez, G., Santos, G., Sá, J.C., Ricardo, S., Pulido, J., Pizarro, A., Hernández, H. 2019. Improvement of productivity and quality in the value chain through lean manufacturing - A case study. *Procedia Manufacturing* 41, 882-889. <https://doi.org/10.1016/j.promfg.2019.10.011>
- Jin, Y., Ji, S., Li, X. and Yu, J., 2017. A scientometric review of hotspots and emerging trends in additive manufacturing. *Journal of Manufacturing Technology Management*, [online] 28(1), pp.18–38. <https://doi.org/10.1108/JMTM-12-2015-0114>.

- Khaskhely, M.K., Qazi, S.W., Khan, N.R., Hashmi, T. and Chang, A.A.R., 2022. Understanding the Impact of Green Human Resource Management Practices and Dynamic Sustainable Capabilities on Corporate Sustainable Performance: Evidence From the Manufacturing Sector. *Frontiers in Psychology*, [online] 13. <https://doi.org/10.3389/fpsyg.2022.844488>.
- Kothari, C.R. and Garg, G., 2019. *Research methodology methods and techniques*. 4<sup>o</sup> ed. *New Age International*. Nova Deli: New Age International.
- Kramar, R., 2014. Beyond strategic human resource management: is sustainable human resource management the next approach? *The International Journal of Human Resource Management*, [online] 25(8), pp.1069–1089. <https://doi.org/10.1080/09585192.2013.816863>.
- Kramar, R., 2022. Sustainable human resource management: six defining characteristics. *Asia Pacific Journal of Human Resources*, [online] 60(1), pp.146–170. <https://doi.org/10.1111/1744-7941.12321>.
- Leidner, S., Baden, D. and Ashleigh, M.J., 2019. Green (environmental) HRM: aligning ideals with appropriate practices. *Personnel Review*, [online] 48(5), pp.1169–1185. <https://doi.org/10.1108/PR-12-2017-0382>.
- Liu, C. and Gui, Q., 2016. Mapping intellectual structures and dynamics of transport geography research: a scientometric overview from 1982 to 2014. *Scientometrics*, [online] 109(1), pp.159–184. <https://doi.org/10.1007/s11192-016-2045-8>.
- Liu, X., Jiang, T. and Ma, F., 2013. Collective dynamics in knowledge networks: Emerging trends analysis. *Journal of Informetrics*, [online] 7(2), pp.425–438. <https://doi.org/10.1016/j.joi.2013.01.003>.
- Ma, X., Zhang, L., Wang, J. and Luo, Y., 2019. Knowledge Domain and Emerging Trends on Echinococcosis Research: A Scientometric Analysis. *International Journal of Environmental Research and Public Health*, [online] 16(5), p.842. <https://doi.org/10.3390/ijerph16050842>.
- Macke, J. and Genari, D., 2019. Systematic literature review on sustainable human resource management. *Journal of Cleaner Production*, [online] 208, pp.806–815. <https://doi.org/10.1016/j.jclepro.2018.10.091>.
- Mariappanadar, S., 2003. Sustainable human resource strategy. *International Journal of Social Economics*, [online] 30(8), pp.906–923. <https://doi.org/10.1108/03068290310483779>.
- Maskuroh, N., Widyanty, W., Nurhidajat, R., Wardhana, I.W. and Fahlevi, M., 2023. Green human resource management and green supply Chain Management on Sustainable performance of nickel mining companies in Indonesia. *Uncertain Supply Chain Management*, [online] 11(1), pp.203–212. <https://doi.org/10.5267/j.uscm.2022.10.006>.
- Masri, H.A. and Jaaron, A.A.M., 2017. Assessing green human resources

- management practices in Palestinian manufacturing context: An empirical study. *Journal of Cleaner Production*, [online] 143, pp.474–489. <https://doi.org/10.1016/j.jclepro.2016.12.087>.
- Mishra, P., 2017. Green human resource management. *International Journal of Organizational Analysis*, [online] 25(5), pp.762–788. <https://doi.org/10.1108/IJOA-11-2016-1079>.
- Molina-Azorin, J.F., López-Gamero, M.D., Tarí, J.J., Pereira-Moliner, J. and Pertusa-Ortega, E.M., 2021. Environmental Management, Human Resource Management and Green Human Resource Management: A Literature Review. *Administrative Sciences*, [online] 11(2), p.48. <https://doi.org/10.3390/admsci11020048>.
- Napathorn, C., 2022. The implementation of green human resource management bundles across firms in pursuit of environmental sustainability goals. *Sustainable Development*, [online] 30(5), pp.787–803. <https://doi.org/10.1002/sd.2271>.
- Obedgiu, V., 2017. Human resource management, historical perspectives, evolution and professional development. *Journal of Management Development*, [online] 36(8), pp.986–990. <https://doi.org/10.1108/JMD-12-2016-0267>.
- Olexová, C. and Gajdoš, J., 2016. Logistics Simulation Game Proposal – a Tool for Employees’ Induction. *Quality Innovation Prosperity*, [online] 20(2), p.53. <https://doi.org/10.12776/qip.v20i2.753>.
- Opatha, H.H.D.N.P. and Arulrajah, A.A., 2014. Green Human Resource Management: Simplified General Reflections. *International Business Research*, [online] 7(8). <https://doi.org/10.5539/ibr.v7n8p101>.
- Paulet, R., Holland, P. and Morgan, D., 2021. A meta-review of 10 years of green human resource management: is Green HRM headed towards a roadblock or a revitalisation? *Asia Pacific Journal of Human Resources*, [online] 59(2), pp.159–183. <https://doi.org/10.1111/1744-7941.12285>.
- Pestana, M.H., Sánchez, A.V. and Moutinho, L., 2019. The network science approach in determining the intellectual structure, emerging trends and future research opportunities – An application to senior tourism research. *Tourism Management Perspectives*, [online] 31, pp.370–382. <https://doi.org/10.1016/j.tmp.2019.07.006>.
- Randev, K.K. and Jha, J.K., 2019. Sustainable Human Resource Management: A Literature-based Introduction. *NHRD Network Journal*, [online] 12(3), pp.241–252. <https://doi.org/10.1177/2631454119873495>.
- Redante, R.C., de Medeiros, J.F., Vidor, G., Cruz, C.M.L. and Ribeiro, J.L.D., 2019. Creative approaches and green product development: Using design thinking to promote stakeholders’ engagement. *Sustainable Production and Consumption*, [online] 19, pp.247–256. <https://doi.org/10.1016/j.spc.2019.04.006>.
- Ren, S., Tang, G. and E. Jackson, S., 2018. Green human resource management

research in emergence: A review and future directions. *Asia Pacific Journal of Management*, [online] 35(3), pp.769–803. <https://doi.org/10.1007/s10490-017-9532-1>.

Renwick, D.W.S., Redman, T. and Maguire, S., 2013. Green Human Resource Management: A Review and Research Agenda\*. *International Journal of Management Reviews*, [online] 15(1), pp.1–14. <https://doi.org/10.1111/j.1468-2370.2011.00328.x>.

Ricardo de Souza Freitas, W., José Chiappetta Jabbour, C. and César Almada Santos, F., 2011. Continuing the evolution: towards sustainable HRM and sustainable organisations. *Business Strategy Series*, [online] 12(5), pp.226–234. <https://doi.org/10.1108/17515631111166861>.

Rocha, A.B.T. da, Oliveira, K.B. de, Espuny, M., Reis, J.S. da M. and Oliveira, O.J. de, 2022. Business Transformation Through Sustainability Based on Industry 4.0. *Heliyon*, [online] 8(8), p.e10015. <https://doi.org/10.1016/j.heliyon.2022.e10015>.

Rodrigues, J., De Sá, J.C.V., Ferreira, L.P., Silva, F.J.G. and Santos, G., 2019. Lean Management “Quick-Wins”: Results of Implementation. A Case Study. *Quality Innovation Prosperity*, [online] 23(3), pp.3-21 <https://doi.org/10.12776/qip.v23i3.1291>.

Ruan, J., Jiang, H., Zhu, C., Hu, X., Shi, Y., Liu, T., Rao, W. and Chan, F.T.S., 2019. Agriculture IoT: Emerging Trends, Cooperation Networks, and Outlook. *IEEE Wireless Communications*, [online] 26(6), pp.56–63. <https://doi.org/10.1109/MWC.001.1900096>.

Sá, C., Amaral, A., Barreto, L., Carvalho, F., Santos, G. 2019. Perception of the importance to implement ISO 9001 in organisations related to people linked to quality – an empirical study. *International Journal for Quality Research*, 13(4) 1055–1070.

Saeed, B. Bin, Afsar, B., Hafeez, S., Khan, I., Tahir, M. and Afridi, M.A., 2019. Promoting employee’s proenvironmental behavior through green human resource management practices. *Corporate Social Responsibility and Environmental Management*, [online] 26(2), pp.424–438. <https://doi.org/10.1002/csr.1694>.

Santana, M., Morales-Sánchez, R. and Pasamar, S., 2020. Mapping the Link between Corporate Social Responsibility (CSR) and Human Resource Management (HRM): How Is This Relationship Measured? *Sustainability*, [online] 12(4), p.1678. <https://doi.org/10.3390/su12041678>.

Santos, G.; Barbosa, J. 2006. QUALIFOUND - a modular tool developed for Quality Improvement in Foundries. *Journal of Manufacturing Technology Management*, 17(3), 351-362. <https://doi.org/10.1108/17410380610648308>.

Santos, D.; Rebelo, M.; Santos, G. 2017. The Integration of certified Management Systems. Case Study – Organisations located at the district of Braga, Portugal.

*Procedia Manufacturing* 13, 964-971.

<https://doi.org/10.1016/j.promfg.2017.09.168>

Santos G., Rebelo, M., Ramos S., Silva, R., Pereira M., Ramos, G., 2014. Developments regarding the integration of the occupational safety and health with quality and environment management systems. In Ilias G. Kavouras & Marie-Cecile G. Chalbot. (Ed.), *Developments Regarding the Integration of the Occupational Safety and Health with Quality and Environment Management Systems*, 113-146. New York: Nova Publishers New York

Schoemaker, R., 2019. *Green Human Resource Management: a general review*. Tilburg University.

Sharma, R. and Gupta, N., 2015. *Green HRM: An Innovative Approach to Environmental Sustainability*. [online] University of Jammu. Available at: <<http://www.aims-international.org/aims12/12A-CD/PDF/K723-final.pdf>> [Accessed 15 February 2023].

Singh, R.K., Kumar, A., Garza-Reyes, J.A. and de Sá, M.M., 2020. Managing operations for circular economy in the mining sector: An analysis of barriers intensity. *Resources Policy*, [online] 69(April), p.101752. <https://doi.org/10.1016/j.resourpol.2020.101752>.

Small, H., 1973. Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, [online] 24(4), pp.265–269. <https://doi.org/10.1002/asi.4630240406>.

Smojver, V., Štorga, M. and Zovak, G., 2021. Exploring knowledge flow within a technology domain by conducting a dynamic analysis of a patent co-citation network. *Journal of Knowledge Management*, [online] 25(2), pp.433–453. <https://doi.org/10.1108/JKM-01-2020-0079>.

Soltanmohammadi, A., Andalib Ardakani, D., Dion, P.A. and Hettiarachchi, B.D., 2021. Employing total quality practices in sustainable supply chain management. *Sustainable Production and Consumption*, [online] 28, pp.953–968. <https://doi.org/10.1016/j.spc.2021.07.013>.

Stankevičiūtė, Ž. and Savanevičienė, A., 2018. Designing Sustainable HRM: The Core Characteristics of Emerging Field. *Sustainability*, [online] 10(12), p.4798. <https://doi.org/10.3390/su10124798>.

Tan Luc, P., Xuan Lan, P., Nhat Hanh Le, A. and Thanh Trang, B., 2022. A Co-Citation and Co-Word Analysis of Social Entrepreneurship Research. *Journal of Social Entrepreneurship*, [online] 13(3), pp.324–339. <https://doi.org/10.1080/19420676.2020.1782971>.

Tang, G., Chen, Y., Jiang, Y., Paillé, P. and Jia, J., 2018. Green human resource management practices: scale development and validity. *Asia Pacific Journal of Human Resources*, [online] 56(1), pp.31–55.

<https://doi.org/10.1111/1744-7941.12147>.

Truss, C., Gratton, L., Hope-Hailey, V., McGovern, P. and Stiles, P., 1997. Soft and Hard Models of Human Resource Management: A Reappraisal. *Journal of Management Studies*, [online] 34(1), pp.53–73. <https://doi.org/10.1111/1467-6486.00042>.

Westerman, J.W., Rao, M.B., Vanka, S. and Gupta, M., 2020. Sustainable human resource management and the triple bottom line: Multi-stakeholder strategies, concepts, and engagement. *Human Resource Management Review*, [online] 30(3), p.100742. <https://doi.org/10.1016/j.hrmr.2020.100742>.

Yong, J.Y., Yusliza, M.-Y. and Fawehinmi, O.O., 2019. Green human resource management. *Benchmarking: An International Journal*, [online] 27(7), pp.2005–2027. <https://doi.org/10.1108/BIJ-12-2018-0438>.

Zacher, H., Rudolph, C.W. and Katz, I.M., 2023. Employee Green Behavior as the Core of Environmentally Sustainable Organisations. *Annual Review of Organizational Psychology and Organizational Behavior*, [online] 10(1), pp.465–494. <https://doi.org/10.1146/annurev-orgpsych-120920-050421>.

Zhykharieva, V., Vlasenko, O., Poznanska, I., Matviienko, M. and Sokolova, M., 2021. The role of human resource management in the concept of sustainable enterprise development. *E3S Web of Conferences*, [online] 255, p.01024. <https://doi.org/10.1051/e3sconf/202125501024>.

Zgodavova, K.; Bober, P.; Majstorovic, V.; Monkova, K.; Santos, G.; Juhaszova, D. 2020. Innovative methods for small mixed batches production system improvement: The case of a bakery machine manufacturer. *Sustainability (Switzerland)*, 12, 6266. <https://doi.org/10.3390/su12156266>.

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## CONFLICTS OF INTEREST

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