

MAPPING IDEA & LITERATURE FORMAT | RESEARCH ARTICLE

Green Human Resource Management as a Strategic Driver of Organizational Sustainability: Emerging Practices, Green Innovation, and Net-Zero Workforce Transformation

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ARTICLE HISTORY

Received: August 30, 2026

Revised: September 21, 2026

Accepted: October 21, 2026

DOI

<https://doi.org/10.52970/grmilf.v6i4.2702>

ABSTRACT

Green human resource management (GHRM) is a strategic approach to integrating environmental objectives into human resource management and promoting organizational sustainability. This review examines GHRM practices, green innovation, and net-zero workforce transformation through a keyword-driven search of peer-reviewed literature and narrative synthesis. The findings indicate that green recruitment, training, performance management, rewards, and employee involvement can support environmental performance when implemented as an integrated system. Green innovation provides an important pathway connecting GHRM with environmental and organizational outcomes. However, its effectiveness depends on leadership commitment, organizational culture, stakeholder pressures, and employee capabilities. The review also identifies uneven implementation and limited attention to social sustainability, economic performance, employee well-being, and workforce transformation. GHRM should therefore be integrated with measurable sustainability objectives while protecting employee well-being and supporting a just transition. Future research should improve methodological transparency and investigate the long-term effects of GHRM across diverse organizational contexts.

Keywords: Green Human Resource Management, Organizational Sustainability, Green Innovation, Net-Zero Workforce Transformation, Sustainable Human Resource Management.

I. Introduction

Workplace greening is a major managerial challenge, placing human resource management at the centre of environmental strategy. Global climate agreements and industrial disasters including the 2005 BP Texas City Refinery accident, which killed 15 people and injured more than 100 highlight the human and ecological costs of environmental failure (Renwick et al., 2012). Yet scandals such as Volkswagen's emissions cheating and the Brazil mining tragedy persist, reflecting an instrumental approach that reduces sustainability to eco-efficiency rather than meaningful environmental responsibility (Stahl et al., 2019). The net-zero transition has significant social and economic consequences. Without effective carbon dioxide removal, limiting warming to 2°C requires phasing out fossil fuels by 2050, potentially displacing 1.7 million U.S. fossil-fuel workers and affecting dependent communities worldwide (Lim et al., 2023). A Just Transition therefore



seeks public support for affected workers and a fair distribution of the transition's costs and benefits (Lim et al., 2023). It also requires decent, well-paid jobs, career progression, and recognition and participation for workers and communities (Bray et al., 2022). Without timely intervention, rising demand for green skills could leave emerging industries with skills gaps while harming workers in declining industries (Bray et al., 2022). The net-zero transition is thus a human resource challenge as well as a technological and policy one.

Green skills shortages may hinder the transition to a Green Economy, while gaps in learning, management and research further weaken responses to environmental change (Alcamo et al., 2012). Green jobs include work that preserves or restores environmental quality, from renewable-energy roles to building retrofits (Alcamo et al., 2012). Accordingly, GHRM is a strategic function: it helps organizations develop and implement sustainable strategies (Bahuguna et al., 2022) and equips employees with green skills where education systems cannot supply enough industry-ready workers (Napathorn, 2021). This review examines GHRM as a driver of organizational sustainability, focusing on its definitions, theoretical foundations, emerging practices, green innovation and net-zero workforce transformation. It also presents the review methodology and the theoretical perspectives used to study the field.

II. Literature Review and Hypothesis Development

2.1. Green Human Resource Management

GHRM is commonly defined as "the HRM aspects of Environmental Management," linking environmental management and HRM (Renwick et al., 2012). It has also been defined as "HRM activities which enhance positive environmental outcomes," including reducing workplace pollution and waste and improving energy use (Stahl et al., 2019). Wagner describes it as the parts of sustainable HRM addressing environmental sustainability (Paulet et al., 2021). The term emerged as Renwick and colleagues brought environmental concerns more systematically into HRM research; the first special issue on GHRM followed in 2011 (Jabbour & Jabbour, 2015). The field's central principle is to align HRM practices with organizational environmental-management aims (Jabbour & Jabbour, 2015).

a. Definition and Scope of Green Human Resource Management

1) Green Innovation

Green innovation is defined through its two principal dimensions: green product innovation and green process innovation. Awan, Arnold and Gölgeci (Awan et al., 2020) describe green innovation as a highly prevalent phenomenon that provides firms with the opportunity to reduce their negative impact on the environment, enabling the development of product and production processes that are less harmful to the natural environment. As a consequence of environmental concerns, the manufacturing industry has geared its efforts toward the implementation of green innovation for reducing energy, pollution, recycling of waste and utilisation of remanufactured materials, and the adoption and integration of green innovation has contributed to creating more revenue opportunities and reducing environmental impact among multinational enterprises (Awan et al., 2020). Green product innovation and green process innovation have provided abundant opportunities to firms for mobilising resources to safeguard the natural environment and encourage prosperity, and both have the potential to tackle environmental-related problems and to make a distinct contribution to environmental sustainability (Awan et al., 2020). Green innovation matters for this review because it functions as a critical mediating mechanism linking GHRM practices to environmental performance: Singh and colleagues (Singh et al., 2019) find that green innovation positively and significantly mediates the effect of green HRM practices on environmental performance.

2) Organizational Sustainability

Organizational sustainability is understood here in its triple-bottom-line sense. Yong and colleagues (Yong et al., 2022) operationalise sustainability as social, environmental and economic performance, finding that green HRM is positively related to all three, and that green HRM positively mediates the relationships between green human capital and economic, social and environmental performance. Paulet, Holland and Morgan (Paulet et al., 2021) anchor this tripartite conception in Elkington's seminal Triple Bottom Line

concept, encompassing three sustainability aspects: economy, society and environment. The recent systematic review by Miah, Szabó-Szentgróti and Walter (Miah et al., 2024) confirms that GHRM research has gained the highest interest in employees' sustainable behaviour and environmental sustainability, but notes that there are few studies on social sustainability and economic performance — a distributional imbalance that this review flags as a gap.

3) Net-Zero Workforce Transformation

Net-zero workforce transformation refers to changes in jobs, labour markets and skills needed for a low-carbon economy, alongside efforts to ensure that the transition is fair. It is closely linked to the Just Transition, which addresses both the ethics and governance of the clean-energy transition (Lim et al., 2023) and seeks decent, well-paid jobs, career progression, and a fair distribution of costs and benefits (Bray et al., 2022). The scale of change is substantial: phasing out fossil fuels to limit warming to 2°C could displace 1.7 million U.S. fossil-fuel workers (Lim et al., 2023). Workforce capacity is also essential to the transition. Green jobs include work that preserves or restores environmental quality, while shortages of skilled workers may hinder the shift to a Green Economy (Alcamo et al., 2012). The transition also faces a geographic challenge: workers may not live near emerging green jobs, making relocation or access to new employment a greater barrier than reskilling alone (Lim et al., 2023). Evidence from Thailand shows how firms can help address skills gaps through GHRM practices, including green recruitment, training, performance management, rewards and employee relations, thereby improving environmental and social performance (Napathorn, 2021).

4) Distinguishing GHRM from Sustainable HRM and Socially Responsible HRM

GHRM is part of the broader field of sustainable HRM, but it is also studied as a distinct field. Sustainable HRM encompasses strategies and practices designed to achieve financial, social and ecological goals while maintaining the human-resource base over time (Paulet et al., 2021). Lu and colleagues (Lu et al., 2022) distinguish socially responsible HRM from green HRM. Socially responsible HRM seeks social value—for example, by improving an organization's social reputation and addressing the effects of business on internal and external stakeholders. However, these practices ultimately serve economic objectives, such as reducing risk, strengthening reputation, attracting talent and increasing profits and shareholder value (Lu et al., 2022). Green HRM, in contrast, focuses on economic and environmental outcomes. It aims to create ecological value through practices such as virtual interviews, environmental-awareness training, and rewards for car-pooling or electronic filing. These practices can improve efficiency, lower costs and reduce carbon footprints while encouraging employee engagement (Lu et al., 2022).

The following table summarises these distinctions.

Table 1. Distinguishing GHRM from Sustainable HRM and Socially Responsible HRM

Concept	Primary value orientation	Underlying objective	Illustrative practices	Source
Green HRM	Ecological value; economic and environmental outcomes	Environmental sustainability	Green recruitment (virtual interviews), green awareness training, green rewards (car-pooling, electronic filing)	(Lu et al., 2022)
Socially responsible HRM	Social value (e.g. social reputation)	Economic, subsumed for economic purposes	Practices responding to social expectations of internal and external stakeholders	(Lu et al., 2022)
Sustainable HRM (umbrella)	Financial, social and ecological goals	Simultaneous goal achievement and reproduction of the HR base over time	Planned or emerging HR strategies and practices	(Paulet et al., 2021)

b. Theoretical Foundations

GHRM scholarship draws on a relatively small set of organisational theories, and a meta-review of a decade of Green HRM research catalogues these as occupational psychology theories, ability–motivation–opportunity theory, stakeholder theory, social identity theory and the resource-based view (Paulet et al., 2021). Each is examined below.

1) Ability–Motivation–Opportunity Framework

AMO theory is among the most widely used frameworks for explaining how HRM practices affect organizational performance in empirical research, and it provides a conceptual structure for much of the GHRM literature (Renwick et al., 2012). In this framework, HRM enhances employees' ability by attracting and developing capable personnel, strengthens their motivation and commitment through measures such as contingent rewards and effective performance management, and expands their opportunity to contribute through employee involvement in knowledge sharing and problem-solving (Renwick et al., 2012). In relation to environmental outcomes, AMO theory proposes that HRM practices can strengthen an organization's human capital by developing employee capabilities, which may in turn improve performance through greater productivity, reduced waste, higher quality and increased profitability (Renwick et al., 2012).

2) Resource-Based View and Natural Resource-Based View

The RBV of the firm theoretically supports the positive effects of HRM, while its extension, the natural resource-based view, supports the positive effects of sustainability-related initiatives on firm performance (Jabbour et al., 2019). Jabbour and colleagues (Jabbour et al., 2019) explain that by taking into account the NRBV, sustainability initiatives — such as circular economy practices — are believed to create unique and long-lasting competitive advantages for organizations. Singh and colleagues (Singh et al., 2019) apply the RBV to the HRM–performance link by treating leadership and employees as a critical resource similar to any other firm resource, where the foremost aim of GHRM practices is to develop, motivate and provide opportunities to exhibit superior job behaviours for a firm's sustained competitive advantage and superior performance. They argue that human resources satisfy the criteria of the RBV for generating and supporting higher performance and competitive advantage, because human capital is normally embedded in a firm's multifaceted social systems, which makes human capital take on organization-specific features useful enough for a particular firm relative to rivals in the markets (Singh et al., 2019).

5) Theoretical Consolidation and Its Limits

The table below consolidates the dominant theoretical lenses.

Table 2. Theoretical Consolidation and Its Limits

Theory	Core proposition	Application in GHRM research	Source
Ability–Motivation–Opportunity	Ability, motivation and opportunity are determinants of the implementation of environmental management practices; the three must co-exist	Structures green recruitment, training, appraisal, incentives, involvement and autonomy practices	(Al-Swidi et al., 2021; Renwick et al., 2012; Yu et al., 2019)
Resource-Based View / Natural Resource-Based View	Human capital and sustainability initiatives create organization-specific, hard-to-imitate resources and long-lasting competitive advantage	Explains GHRM's contribution to sustained competitive advantage and environmental performance	(Jabbour et al., 2019; Singh et al., 2019)
Stakeholder Theory	Organizations must account for the interests of those who affect or are affected by them; HRM both influences and is influenced by sustainability management	Justifies employee motivation for sustainability engagement and alignment of HRM systems with sustainability objectives	(Jabbour et al., 2019)
Social Identity Theory	Membership in a valued group shapes individual thoughts, habits and self-realisation	Explains employee pride, identification and commitment arising from organizational	(Al-Swidi et al., 2021; Tandon et al., 2023)

		green objectives communicated through GHRM	
Social Exchange Theory	Employees who perceive benefits from their organization feel obligated to reciprocate	Explains employee commitment and citizenship behaviour as mediators between GHRM and performance	(Pham et al., 2019)

This theoretical plurality should not be mistaken for theoretical maturity. Paulet, Holland and Morgan (Paulet et al., 2021) report that both Ren et al. (2018) and Yong et al.'s (2019) reviews concluded that systematic theoretical bases require further development to advance Green HRM research, and quote Ren et al.'s observation that "owing to the relatively young age of GHRM as a field, there is not yet sufficient variety in the theoretical perspectives utilized to assess which are likely to prove most useful for future development." The field's explanatory apparatus is therefore best characterised as promising but underdeveloped.

6) Review Methodology and Structure

This review adopts the systematic literature review tradition established within GHRM scholarship. Renwick, Redman and Maguire (Renwick et al., 2012) conducted a systematic review using an archival method to develop a reliable knowledge base of the field. They classified literature across the full spectrum of HRM practices, covering publications from 1988 to 2011, and excluded studies that did not address environmental management and HRM in a broad sense. Their review included more than 200 books, journal articles, edited works and discussion papers. Renwick and colleagues (Renwick et al., 2015) subsequently extended earlier reviews by examining themes in the HRM, environmental management and environmental sustainability literatures. They searched for English-language publications in Business and Management and Psychology, using terms such as environment, environmental, pro-environmental, ecology, ecological, green, human resources, human resource management, sustainability and ES. Searches across Scopus, Web of Science, EBSCO, ProQuest and PsycINFO identified 693 potentially relevant articles, books, chapters and reports. Yong, Yusliza and Fawehinmi (Yong et al., 2019) also used a systematic review approach, classifying selected journal articles according to five focus areas derived from the existing literature. Their review included 70 articles and was restricted to high-quality, peer-reviewed journals. The review is structured to reflect these considerations. After this introduction, it examines GHRM's theoretical foundations in greater detail before considering emerging green HR practices, GHRM's role in promoting green innovation, and its contribution to net-zero workforce transformation. It concludes by bringing together implications for research and practice.

c. The Field's Rapid Growth and Strategic Repositioning

Research on GHRM has grown rapidly, reflecting its perceived strategic importance. Shah and colleagues (Shah et al., 2023) report that publications have doubled over the past decade, with emerging themes including green HR practices, corporate social responsibility, innovation, environmental performance, the circular economy and sustainable development. Yong, Yusliza and Fawehinmi (Yong et al., 2019) likewise note significant growth over the past 12 years, particularly in studies of organizational- and individual-level performance outcomes. Although Bahuguna, Srivastava and Tiwari (Bahuguna et al., 2022) describe GHRM as a developing field that needs more rigorous research, Miah, Szabó-Szentgróti and Walter (Miah et al., 2024) report that 63% of the articles they reviewed were published in the past three years, most in Q1 journals. The growing number of reviews—10 since 2013—further indicates that GHRM is emerging as a distinct area of inquiry within HRM (Paulet et al., 2021).

2.2. Emerging GHRM Practices and Their Measurement

a. The AMO-Enhancing Classification of GHRM Practices

The ability–motivation–opportunity framework is the most widely used approach for organizing GHRM practices. Renwick, Redman, and Maguire introduced it to the green HRM literature, and later reviews have adopted it (Renwick et al., 2012). The framework groups HRM practices into those that enhance employees' abilities, motivation, and opportunities (Renwick et al., 2012). Yu et al. apply the same framework to green supply chain management: training and development build ability, promotion motivates employees, and opportunities to contribute provide the third component (Yu et al., 2019). The framework is integrative: employees need ability, motivation, and opportunity together, since training alone may not lead to

involvement (Yu et al., 2019). These categories correspond to recurring GHRM practices in the literature. Table 1 summarizes them.

Table 3. Categories Correspond to Recurring GHRM Practices

AMO component	Practice categories	Illustrative sub-practices
Ability	Green recruitment and selection; green training and development	Green criteria in selection; green job descriptions; environmental training to build knowledge, skills and attitudes
Motivation	Green performance management and appraisal; green pay, rewards and compensation	Environmental objectives in appraisals; green targets; financial and recognition-based rewards
Opportunity	Green employee involvement, empowerment and teamwork	Suggestion schemes, problem-solving groups, green teams, green action teams, autonomy

b. Green Recruitment and Selection

Green recruitment and selection is an important GHRM practice and one of the areas with the most extensive review evidence. A systematic review of 22 peer-reviewed articles published between 2008 and 2017 found that some organizations use environmental criteria to select candidates, while others do not. In either case, communicating an organization's environmental values and orientation can support recruitment (Pham & Paillé, 2019). The review identified four factors that mediate the relationship between signals of corporate environmental sustainability and job seekers' perceptions of organizational attractiveness: anticipated pride, perceived value fit, expectations of favourable treatment, and perceived green reputation or prestige. Five factors moderate this relationship: pro-environmental attitudes, socio-environmental consciousness, the desire to make a meaningful impact through work, environmental standards or certifications, and job seekers' expertise (Pham & Paillé, 2019).

c. Green Training and Development

Green training is an ongoing process of workplace instruction and education intended to help organizations achieve their environmental management objectives (Pinzone et al., 2019). Pinzone et al. characterize green competence-building practices as those that develop employees' environmental knowledge and skills, enabling them to identify environmental issues, understand and manage complex environmental problems, and recognize the environmental effects of their work activities (Pinzone et al., 2016). Similarly, Pham et al. define green training as an environmental policy that equips employees with the knowledge, skills, and attitudes they need (Pham et al., 2019).

d. Green Performance Management and Appraisal

Green performance management guides employees in aligning their behaviour with the firm's environmental goals (Pham et al., 2019). Some authors regard integrating environmental concerns into performance management and appraisal as essential to moving beyond corporate social responsibility rhetoric; others argue that changes to PMA practices and leadership competencies are needed to sustain progress towards environmental goals (Renwick et al., 2015). Examples include Eco Concierge's use of environmentally motivated employees as internal green champions and environmental objectives in performance plans for construction project managers at the UK Environment Agency. In the UK civil aviation sector, PMA systems and training contribute directly to green performance by helping achieve optimum flight levels, while management policies can also compel employees to adopt green behaviours (Renwick et al., 2015).

e. Green Pay, Rewards and Compensation

Renwick et al. catalogue a range of green pay and reward practices: rewarding staff suggestions on environmental management; linking rewards to EM skills through skill-based pay; offering green transport benefits or incentives for purchasing green products; providing financial or tax incentives, such as bicycle loans or support for less-polluting cars; paying monetary rewards or monthly bonuses for good EM; linking senior staff performance-related pay and executive compensation to green targets or EM stewardship; and recognizing staff through public recognition, awards, paid leave, or gift certificates (Renwick et al., 2012).

Evidence on green rewards remains limited. Jackson et al. cite a UK CIPD/KPMG survey estimating that 8% of firms rewarded green behaviours through awards or financial incentives, and note some evidence that these practices can motivate employees to propose eco-initiatives (Jackson et al., 2011). They caution, however, that poorly designed incentives may lead employees to maximize measured performance at the expense of employers, customers, or society. Rewards tied to environmental objectives are also vulnerable to such unintended effects (Jackson et al., 2011). Shahriari et al. report the same 8% estimate and note a study by Forman and Jorgensen finding that employee participation in environmental management programs increased when employees were given environmental responsibilities as a reward (Shahriari et al., 2019). Fayyazi et al. report that green organizations use incentives and disincentives to encourage recycling and waste reduction. Although individual rewards may be based on employees' environmental behaviours, this approach has not been shown to produce significant improvements in company environmental performance (Fayyazi et al., 2014).

f. Green Employee Involvement, Empowerment and Teamwork

Green employee involvement aims at providing opportunities for workers to participate in environmental initiatives and activities (Pham et al., 2019). Renwick et al. describe EI practices in EM as including newsletters, suggestion schemes, problem-solving groups, low carbon champions, and green action teams, while empowerment and engagement involve encouraging employees to make suggestions for EM improvements, increasing employees' psychological empowerment to enhance their willingness to make suggestions for EM improvements, and supportive managerial and supervisor behaviours that develop employee engagement in EM (Renwick et al., 2012). Their account of how employee involvement operates identifies three core processes: first, through tapping employees' tacit knowledge gained through their close links to the production process; second, through engaging and empowering employees to make suggestions for environmental improvements; and third, through developing a culture in the workplace which supports EM improvement efforts (Renwick et al., 2012). Case study research in Canada in smelting plants of oil and copper refineries reports the importance of workers' tacit knowledge as being particularly useful in identifying pollution sources, managing emergency situations, and developing preventive solutions, and a study of worker participation in environmental management initiatives in the NUMMI automobile plant in the U.S. found that employee involvement makes an important contribution to improving environmental performance as "employees possess knowledge and skills that managers lack" (Renwick et al., 2012).

g. From Isolated Functions to Integrated GHRM Systems and Bundles

GHRM is increasingly conceptualized as an integrated system of mutually reinforcing practices rather than a set of separate functions. Ogbeibu et al. identify green recruitment and selection, training, involvement and development, and performance and compensation as bundle components. They find that technological turbulence, green recruitment and selection, and green training, involvement and development positively predict green team creativity, whereas green performance and compensation negatively predict it (Ogbeibu et al., 2019). Similarly, Úbeda García et al. find that a green high-performance work system, understood as an integrated bundle, supports the development of green ambidexterity (García et al., 2021). The ability–motivation–opportunity framework provides a rationale for this integrated approach: employees need the ability, motivation, and opportunity to contribute to environmental management (Yu et al., 2019).

h. Measurement Scales and Their Dimensions

Several instruments have been developed to measure GHRM, but no single scale has become standard. Tang et al. developed and validated a five-dimension scale covering green recruitment and selection, training, performance management, pay and rewards, and employee involvement. Exploratory analysis identified these dimensions, and confirmatory factor analysis supported the scale's structure (Tang et al., 2017). Shah developed a scale using a two-stage structural equation modeling approach in AMOS. Exploratory factor analysis identified seven dimensions measured by 28 items, and confirmatory factor analysis supported the structure. The scale also showed convergent and discriminant validity, with model-fit indices indicating an acceptable fit (Shah, 2019). Shah notes that although GHRM practices are widely discussed, previous studies have focused on only a few HR functions, and further empirical validation of GHRM measures is needed (Shah, 2019).

i. Practical Variations, Implementation Gaps and Contextual Differences

Implementation is uneven in several respects. Miah, Szabó-Szentgróti, and Walter's systematic review found that the implementation level of GHRM in organizations is moderate, with very few studies in this

aspect, and that most articles used quantitative methodologies and were conducted in developing countries (Miah et al., 2024). This contrasts with the geography noted by Bahuguna et al., whose bibliometric analysis observed that GHRM practice coverage is concentrated in developed countries (Bahuguna et al., 2022). The two findings together point to a literature in which the production of research and the sites of implementation are not aligned.

Sectoral and institutional variation is documented in specific studies. Mishra's multimethod study of manufacturing organizations in India found status of green human resource practices such as environmental training, green recruitment, performance appraisal, employee involvement and compensation, and suggested there is further scope to utilize the full potential of GHRM practices for encouraging pro-environmental behaviour in organizations; analyses of data also revealed that top-management support and mutual learning among departments are crucial to facilitate green behaviours among employees (Mishra, 2017). The study notes that GHRM remains an under-researched area in India, and that studies like these are more important in developing countries, which have alarming environmental concerns and poorly implemented government regulations (Mishra, 2017). Yong et al.'s study of 112 large manufacturing firms in Malaysia found that green recruitment and green training had positive effects on sustainability, whereas green analysis and job description, green selection, green performance assessment, and green reward were not found to have any significant influence on sustainability (Yong et al., 2019).

2.3. Drivers of GHRM Adoption: Why Firms Green Their Workforces

Understanding why organizations adopt green human resource management is analytically distinct from understanding what GHRM subsequently achieves. The antecedent literature is organized around a relatively stable division between pressures that originate outside the firm — institutional, regulatory, and stakeholder demands — and internal dispositions that originate within it, principally top management commitment, senior leadership values, corporate social responsibility orientation, environmental strategy type, and organizational culture. The most theoretically ambitious contributions treat these two clusters not as competing explanations but as jointly necessary: external pressures create the impetus for greening, while internal actors and cultural conditions determine whether that impetus is converted into actual HRM practices (Ren et al., 2020). This section examines each cluster, the mediating logic that connects them to environmental outcomes, the boundary conditions under which translation succeeds or fails, and the critical perspectives that question whether GHRM adoption is always what it appears to be.

a. Institutional and Regulatory Pressures

Institutional theory is the dominant external explanation for GHRM adoption: it holds that external pressures influence organizations' practices (Kannan, 2021). Its central concept, isomorphism, describes how pressure leads organizations facing similar conditions to become more alike. It operates through three mechanisms: coercive pressure from organizations on which a firm depends, including governments and environmentally aware customers; normative pressure from media, civil society, industry associations, and consumers; and mimetic pressure, whereby firms imitate others to gain legitimacy (Kannan, 2021). This framework has been applied to environmental management. Delmas and Toffel argue that governments, regulators, customers, competitors, communities, environmental groups, and industry associations exert coercive and normative pressures on firms. However, managers' responses depend on plant- and parent-company-specific factors, including environmental performance history, the parent company's competitive position, and plant structure (Delmas & Toffel, 2004). For GHRM, this means that similar institutional pressures may prompt different HRM responses because firms interpret and manage them differently.

b. Stakeholder Pressures Beyond Regulation: Customers and Other Actors

Stakeholder theory views green HRM practices as management processes that firms use in response to stakeholder pressure on environmental issues (Guerci et al., 2015). This perspective emphasizes how a firm's social and political context, and actors outside the firm, shape its green HRM practices (Guerci et al., 2015). Customer pressure has received the most research attention. In the Italian study, green training and employee involvement, along with green performance management and compensation, helped firms respond to customer pressure and improve environmental performance. Green hiring was also influenced by customer pressure, but it did not significantly improve environmental performance (Guerci et al., 2015). The authors suggest that employees contribute to environmental performance when they have firm-specific green skills, take part in environmental decisions, understand their environmental duties, and know their efforts are assessed and rewarded (Guerci et al., 2015). This suggests that hiring alone may have limited impact: it selects

people with environmental awareness but does not necessarily build the firm-specific skills needed to improve performance.

c. Internal Antecedents: Top Management Commitment and Senior Leadership Values

If institutional and stakeholder pressures supply the external impetus, top management commitment is the internal condition most consistently identified as necessary for GHRM to be implemented at all. In a study of manufacturing and service organizations in Malaysia, a significant positive relationship was found between top management commitment and CSR, as well as with all dimensions of GHRM, leading the authors to highlight the crucial importance of top management commitment in implementing GHRM practices and CSR efficiently in order to create positive environmental performance (Yusliza et al., 2019). The mechanism by which top management commitment operates is elaborated in work linking leadership to culture and practice. Top management can play a critical role in developing an organizational vision that can be translated into green leadership behaviours and GHRM practices, which in turn develop a green organizational culture that promotes environmentally friendly attitudes in employees and changes their thinking towards environmental protection; the vision, mission and values should be reflected in HRM practices such as recruiting environmentally conscious individuals, providing environment-related training, rewarding the green initiatives of employees, and empowering them with the infrastructure and resources required (Al-Swidi et al., 2021).

d. CSR Orientation and the Type of Environmental Strategy

A third internal antecedent concerns the firm's broader orientation toward social and environmental responsibility. Theoretically, one would expect a strong CSR orientation to co-occur with strong GHRM. Empirically, however, the evidence is more equivocal. The Malaysian study found that the relationship between CSR and GHRM was not as significant as expected, with the sole exception of CSR and green analysis/job description — a result the authors explain through the emerging perspective that CSR and HRM should be linked (Yusliza et al., 2019). This counterintuitive finding signals that CSR commitments, however visible, do not automatically cascade into HRM practice, and it anticipates the symbolic-versus-substantive debate examined later in this section. The type of environmental strategy a firm pursues is a further antecedent, and one with direct implications for the coherence of green HR development. Vertical consistency is required between the type of corporate environmental strategy and human resource policies and practices, since this consistency makes the message concerning expectations towards employees coherent and serves as the basis for guiding their activities in the appropriate direction (Piwowar-Sulej, 2021). A survey of 299 manufacturing companies in Poland distinguished three environmental strategy types — reactive, preventive, and proactive — and showed that although the most significant relationship exists between the proactive environmental strategy and green HR development treated holistically, there were significant differences in the extent to which individual HR development practices are vertically consistent, and there was a lack of horizontal consistency of HR development (Piwowar-Sulej, 2021). The finding of horizontal inconsistency is particularly relevant to adoption dynamics: firms may adopt a coherent strategic posture while deploying internally contradictory HR practices, meaning that GHRM adoption is better characterized as a bundle of partially aligned practices than as a single unified decision.

e. Organizational and Environmental Culture as Antecedent and Mechanism

Organizational culture occupies an unusual position in this literature, functioning both as an antecedent condition that enables environmental strategy and as a mechanism through which GHRM produces performance effects. From a framework linking GHRM to green supply chain management, organizational culture is described as the most important and most relevant human factor in the greening of organizations, based on top management support, values, and principles for supporting environmental management in companies; once a green culture is established, teamwork and empowerment become necessary to discuss and make decisions regarding complex problems and new perspectives on green supply chain management (Jabbour & Jabbour, 2015). The same framework situates these human factors within a bottom-up reading of change management for the greening of firms (Jabbour & Jabbour, 2015).

f. The Mediation Argument: GHRM as Translator of Greening Pressures

The theoretical core of the strategic case for GHRM is that it mediates the relationship between external greening pressures and environmental protection practices and performance. The foundational statement of this argument conceives green HRM practices as a set of management processes that companies implement for responding to stakeholder pressures on environmental issues, and empirically tests the distinct

role that different green HRM practices — green hiring, green training and involvement, and green performance management and compensation — play in mediating the relation between pressures from two specific external stakeholders, customers and regulatory stakeholders, and environmental performance (Guerci et al., 2015). Using a multi-respondent survey of human resource managers and supply chain managers operating in Italy, the hypothesized mediation model was confirmed (Guerci et al., 2015), and the study provides evidence that green HRM practices are mechanisms through which stakeholder pressures ultimately affect environmental performance (Guerci et al., 2015).

The following table summarizes the principal mediation findings discussed above.

Table 4. Principal Mediation Findings

Study context	External pressure examined	Mediating mechanism	Outcome and key qualification
Italian HR and supply chain managers (Guerci et al., 2015)	Customer and regulatory stakeholder pressure	Green hiring; green training and involvement; green performance management and compensation	Mediation confirmed; customer pressure affects all practices while regulatory pressure relates only to green hiring; green hiring alone shows no significant effect on environmental performance
Brazilian firms (Vázquez-Brust et al., 2022)	Stakeholder greening pressures	GHRM system (training, assessment, rewards, teamwork)	Partial mediation, stronger for environmental protection hardware than for environmental protection software
European certified organizations (Marrucci et al., 2022)	Institutional and stakeholder pressure	Organizational performance outcomes	Both pressures positively related to performance and GHRM adoption; performance outcomes also positively related to GHRM practices
Chinese manufacturing employees (Roscoe et al., 2019)	— (internal chain)	Enablers of green organizational culture: leadership emphasis, message credibility, peer involvement, employee empowerment	Enablers positively mediate the GHRM–environmental performance relationship
Indian public and private sector employees (Aggarwal & Agarwala, 2022)	— (internal chain)	Three dimensions of green organizational culture: degree, diffusion, depth	Only the degree dimension significantly mediates the GHRM–environmental performance relationship
80 firms, multi-source executive data (Ren et al., 2020)	— (moderated chain)	TMT green commitment	CEO ethical leadership moderates the GHRM–TMT green commitment relationship, which mediates environmental performance

The translation logic can be represented as a sequence in which external pressures enter through institutional channels, are processed by leadership and culture, and are converted into performance via AMO-based HRM practices.

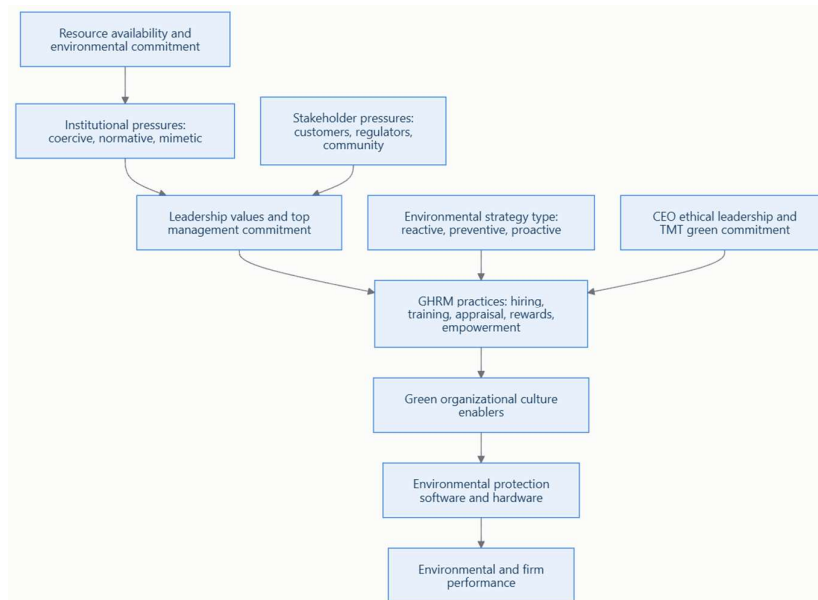


Figure 1. Conceptual Framework of GHRM Adoption and Its Environmental and Firm Performance Outcomes

2.4. Green Innovation as the Strategic Bridge Between GHRM and Performance

Green innovation is a key pathway through which GHRM may generate environmental, economic, and reputational returns. This section summarizes its product and process forms, the evidence linking GHRM to innovation, the roles of green creativity and knowledge sharing, and the resulting performance outcomes. It focuses on firm-level relationships; employee-level behavioral processes are addressed separately.

a. Defining Green Innovation: Product and Process Forms

Green innovation involves developing products and production processes that reduce environmental harm, including through lower energy use and pollution, improved recycling, and the use of remanufactured materials (Awan et al., 2020). The literature distinguishes green product innovation from green process innovation; both can address environmental problems and support sustainability (Awan et al., 2020). Green innovation is also viewed as a strategic resource for environmental performance, with product and process innovations potentially reducing environmental impacts and costs while improving firm performance (Singh et al., 2019). These forms can lead to different outcomes. In Chinese manufacturing, product innovation improved environmental performance but had no significant direct effect on organizational performance or competitive advantage; process innovation improved both organizational and environmental performance, but not competitive advantage. Product innovation contributed to competitive advantage through environmental performance, while process innovation did so through both environmental and organizational performance (El-Kassar & Singh, 2018). Managerial environmental concern strengthened the relationship between process innovation and firm performance, but product innovation did not explain unique variance once concern was included (Tang et al., 2017). External pressures also matter: environmental regulation was linked to financial performance mainly through process innovation, whereas market turbulence operated mainly through product innovation (Qiu et al., 2020).

b. GHRM as an Antecedent of Green Innovation

Reviews identify GHRM as a potential driver of environmental awareness, green creativity, green innovation, and firm performance, while noting that empirical evidence remains limited (Singh et al., 2019). HR can also help organizations establish environmental management systems, support green innovation, and adopt ISO 14001 (Jabbour et al., 2019). Empirical studies generally find a positive relationship between GHRM and green innovation. In 143 Chinese firms, GHRM positively influenced green innovation through green human capital; this indirect effect was significant when management environmental concern was high, but not when it was low (Song et al., 2020). In small lodging enterprises in Greater Cairo, owner-managers' green

ability, motivation, and opportunity positively influenced both green innovation and environmental performance, with ability showing the strongest effects (Sobaih et al., 2020). The relationship is commonly grounded in AMO theory and the resource-based view: GHRM may affect environmental performance through green product and process innovation, while valuable, scarce, and difficult-to-imitate human capital can support performance and competitive advantage (Alshammari et al., 2022; Singh et al., 2019).

c. Intermediate Mechanisms: Green Creativity and Green Knowledge Sharing

Green creativity is one mechanism linking GHRM to innovation. Evidence from medical firms in China suggests that transformational leadership can shape GHRM and employees' green passion, which in turn supports green creativity (Jia et al., 2018). In hotels and resorts, GHRM was positively associated with green creativity through green self-efficacy, although the proposed moderated mediation of green transformational leadership was unsupported (Farooq et al., 2021). In Pakistani product organizations, green perceived organizational support mediated the GHRM–creativity relationship, while green transformational leadership strengthened the GHRM–support link (Hameed et al., 2021). In Chinese coal enterprises, GHRM mediated the relationship between top management's HRM commitment and green creativity, with environmental regulation strengthening both the commitment–GHRM relationship and the indirect pathway (Huo et al., 2020). Team-level findings are mixed. In Malaysian manufacturing organizations, green recruitment and selection, green training, involvement and development, and technological turbulence predicted team creativity positively, whereas green performance and compensation predicted it negatively. Team creativity positively predicted product innovation, while environmental dynamic capability predicted it negatively. Technological turbulence altered the effects of different GHRM practices, and team creativity acted as both a complementary and competitive mediator (Ogbeibu et al., 2019). These results suggest that GHRM's influence on innovation depends on the practices used and the organizational context.

d. From Green Innovation to Environmental Performance

The GHRM–green innovation–environmental performance pathway is frequently examined. Green innovation has been found to mediate the effect of GHRM on firm environmental performance; findings also indicate that green transformational leadership and green innovation can operate through both additive and interactive relationships (Singh et al., 2019). Further studies identify relevant conditions. In Pakistani manufacturing, green innovation and pro-environmental behavior mediated the relationship between GHRM and environmental performance, while environmental strategy moderated the relationship (Aftab et al., 2022). In food manufacturing firms, GHRM and green intellectual capital had no direct effect on environmental performance; green innovation mediated their effects, and environmental strategy moderated the innovation–performance relationship (Ullah et al., 2022). In Turkish green hotels, environmental performance was higher when GHRM was accompanied by employee environmental commitment and green process innovation (Irani et al., 2022). Specific practices and organizational learning also contribute. Green training and development is associated with environmental performance (Ahakwa et al., 2021; Kuo et al., 2022), while green compensation can recognize environmental contributions and align rewards with green strategies (Ahakwa et al., 2021). GHRM has also mediated the relationship between green intellectual capital and environmental performance, with green human and relational capital positively related to performance (Mansoor et al., 2021). In Pakistani manufacturing, GHRM supported environmental performance through organizational learning capability, with data-driven culture shaping this pathway (Awan et al., 2023).

e. Economic and Financial Performance

The economic effects of GHRM have been debated, but a meta-analysis of 75 studies found positive direct and indirect relationships with economic performance through environmental performance and green supply chain management. Industry, national culture, and the number of GHRM dimensions moderated these relationships, underscoring the importance of contextual fit and effective implementation (Penela et al., 2023). Studies in emerging economies broadly support this pattern. In Malaysian manufacturing, GHRM was positively related to social, environmental, and economic performance and mediated links between green intellectual capital and sustainability outcomes (Yong et al., 2022). In Ghana, GSCM partially mediated the GHRM–performance relationship: its mediation was complementary for operational, market, social, and environmental performance, but competitive for financial performance (Acquah et al., 2020). Another study found that internal green supply chain practices alone could negatively affect market and financial performance, while GHRM and supply-chain environmental cooperation could support improved firm performance (Agyabeng-Mensah et al., 2020). In Pakistan, GSCM mediated the positive relationship between GHRM and environmental performance (Saeed et al., 2021).

There is also evidence that announcing adoption of environmental management systems such as ISO 14001 may increase firms' market value. However, a focus on financial performance alone is limiting; organizational performance requires attention to interdependencies among multiple outcomes (Jackson et al., 2011). Financial returns from GHRM-enabled innovation may also depend on external pressures: regulation is linked to financial performance mainly through process innovation, while market turbulence operates mainly through product innovation (Qiu et al., 2020).

f. **Competitive Advantage**

Competitive advantage is closely associated with the resource-based view, which treats valuable and inimitable human, physical, and organizational resources as sources of sustained performance. GHRM can support this advantage by embedding green practices in organizational systems and developing firm-specific human capital through attracting, developing, and retaining green employees (Malik et al., 2020; Singh et al., 2019). Evidence suggests that this contribution is largely indirect: green product innovation influenced competitive advantage through environmental performance, while green process innovation did so through both environmental and organizational performance. HR practices, training, and management commitment were also examined as moderators of innovation–performance relationships (El-Kassar & Singh, 2018). GHRM is further described as a strategic tool for incorporating green strategies into business models and strengthening firms' competitive position (Yasin et al., 2022).

g. **Triple-Bottom-Line, Circular Economy and SDG Alignment**

Research increasingly frames GHRM's innovation-related outcomes in terms of the triple bottom line, encompassing economic, social, and environmental performance. GHRM may enhance these outcomes by encouraging employees' green behaviour (Jabbour et al., 2019). A study of manufacturing companies in Saudi Arabia examined GHRM and green innovation in relation to all three TBL dimensions, while research involving six large-scale industries found positive associations between GHRM, dynamic sustainable capabilities, and corporate environmental and social performance (Alshammari et al., 2022; Khaskhely et al., 2022). Circular economy performance extends this perspective. In Qatar's service sector, green HRM and empowerment were positively linked to circular economy performance, which in turn was associated with sustainable performance and mediated the relationship between green HRM and sustainable performance (Obeidat et al., 2022). Among European environmentally certified organisations, institutional and stakeholder pressures were positively related to organisational performance and GHRM adoption; however, the findings also highlight the risk that GHRM may become an elitist practice in high-performing organisations (Marrucci et al., 2022). GHRM is also discussed in relation to the United Nations Sustainable Development Goals, which address economic, social, and environmental dimensions through 17 goals and 169 targets (Yasin et al., 2022). Its potential contributions include resource conservation, reducing firms' environmental footprints and operating expenses, and promoting sustainable transportation (Martínez-Falcó et al., 2024). A bibliometric and systematic review covering 1996–2023 highlights HR's role in corporate sustainability and calls for further attention to mental health, gender equality, climate action, responsible production and consumption, and social sustainability (Campos-García et al., 2023).

h. **Meta-Analytic and Review Evidence on Strength and Consistency**

Reviews confirm the breadth and uneven development of research on GHRM, innovation, and performance. A bibliometric analysis of 595 publications from 2002–2022 found that the field has grown substantially, with emerging themes including innovation, environmental performance, circular economy, and sustainable development (Shah et al., 2023). A PRISMA-based review of 48 studies found frequent use of the AMO framework but uneven attention to specific GHRM practices: training and development and performance management were more often examined than job analysis and description (Benevene & Buonomo, 2020). Another review reported that 63% of selected articles were published in the preceding three years, while social sustainability and economic performance remained under-researched; implementation of GHRM was generally moderate and rarely examined (Miah et al., 2024). A meta-review likewise described the field as relatively young and called for research on employee, employer, and societal outcomes, including economic costs and benefits and greenwashing (Paulet et al., 2021). The strongest quantitative synthesis is a meta-analysis of 138 effect sizes from 75 studies. It found positive direct relationships between GHRM and economic performance, as well as indirect relationships through environmental performance and green supply chain management. Industry type, national culture, and the number of GHRM dimensions moderated these relationships (Penela et al., 2023).

Table 5. Meta-Analytic and Review Evidence on Strength and Consistency

Study context	Mediator(s)	Moderator(s)	Key outcome finding
143 firms, China (Song et al., 2020)	Green human capital	Management environmental concern	GHRM positively influences green innovation; indirect effect significant only at high managerial concern
410 manufacturing managers, Pakistan (Aftab et al., 2022)	Green innovation; pro-environmental behaviour	Environmental strategy	Mediation of GHRM → environmental performance supported
456 food manufacturing firms, Pakistan (Ullah et al., 2022)	Green innovation	Environmental strategies	GHRM and green intellectual capital have no direct effect on environmental performance; full mediation via green innovation
409 green hotels, Turkey (Irani et al., 2022)	Employee environmental commitment; green process innovation	—	GHRM yields higher environmental performance when commitment and process innovation are deployed
247 Chinese manufacturing firms (Song et al., 2020)	Absorptive capacity	Stakeholder pressure	Absorptive capacity fully mediates green knowledge sharing → green innovation
274 manufacturing enterprises, Pakistan (Awan et al., 2023)	Organizational learning capability	Data-driven culture	Green HRM facilitates OLC to achieve high environmental performance
Small lodging enterprises, Greater Cairo (Sobaih et al., 2020)	Green innovation	—	GHRM's influence on environmental performance doubled with green innovation
149/131 service-sector managers, Qatar (Obeidat et al., 2022)	Circular economy	—	Circular economy mediates green HRM → sustainable performance
138 effect sizes from 75 studies (Penela et al., 2023)	Environmental performance; GSCM	Industry type; individualism; masculinity; long-term orientation; number of GHRM dimensions	GHRM positively related to economic performance directly and indirectly

i. Moderating and Contextual Conditions

The GHRM–innovation–performance relationship depends on managerial, technological, and institutional conditions. Managerial environmental concern moderates the effect of GHRM on green human capital: the indirect effect of GHRM on green innovation through green human capital is significant when concern is high, but not when it is low (Song et al., 2020). Environmental regulation strengthens the relationship between top management's commitment to HRM and GHRM, as well as GHRM's mediating role in the link between that commitment and green creativity (Huo et al., 2020). Management commitment, HR practices, and training have also been examined as moderators of green innovation–performance relationships (El-Kassar & Singh, 2018). Environmental concern compounds the positive effect of green process innovation on firm performance, but not that of product innovation (Tang et al., 2017). Technological turbulence strengthens the positive effect of green recruitment and selection on green team creativity, while weakening the effects of green training, involvement, and development (Ogbeibu et al., 2019). Data-driven culture moderates and mediates the relationship between green HRM and environmental performance through organizational learning capability (Awan et al., 2023). Absorptive capacity also shapes how knowledge becomes innovation: stakeholder pressure conditions the mediation between green knowledge sharing and green innovation (Song et al., 2020), while green absorptive capacity strengthens mediation between environmental and organizational factors and green innovation performance (Pacheco et al., 2018), and the effect of green entrepreneurial orientation on knowledge creation (Wang et al., 2022). Relationship

learning further moderates the relationship between absorptive capacity and green innovation performance (Albort-Morant et al., 2018).

National and sectoral context also matters. A meta-analysis found that industry type and national cultural dimensions—individualism, masculinity, and long-term orientation—moderate GHRM-related relationships; the number of GHRM dimensions acts as a methodological moderator. The findings underscore the importance of cultural context and effective implementation (Penela et al., 2023). Among European environmentally certified organisations, institutional and stakeholder pressures were positively associated with organisational performance and GHRM adoption, although GHRM may become an elitist practice in high-performing organisations (Marrucci et al., 2022). Evidence on individual GHRM practices is mixed. Among 112 large Malaysian manufacturing firms, green recruitment and training positively affected sustainability, whereas green analysis and job description, selection, performance assessment, and rewards had no significant effects (Yong et al., 2019). By contrast, studies in Ghana and other emerging economies found positive links between green training and environmental performance (Ahakwa et al., 2021; Kuo et al., 2022), and broader evidence from Malaysian manufacturing linked green HRM positively to social, environmental, and economic performance (Yong et al., 2022). At the team level, however, green performance and compensation negatively predicted green team creativity (Ogbeibu et al., 2019). These differences suggest that practice effects vary by context and outcome.

j. A Future Research Agenda

Table 7. Future Research Agenda

Agenda theme	Evidentiary gap	Illustrative source
Multi-level and longitudinal designs	HRM lags education, health, marketing, and psychology in multi-level analytical strategy; progress slow and uneven across 46 multilevel mediation studies (2000–2016)	(Peccei & Voorde, 2016; Shen, 2015)
Paradox-sensitive methods	Traditional quantitative methods risk masking rather than uncovering paradox; longitudinal methods best suited	(Schad et al., 2016)
Technology and Industry 4.0	Technology-based perspectives and Industry 4.0 named as a priority direction; STARA dampens training–sustainability link	(Ogbeibu et al., 2023; Pham et al., 2019)
Circular economy integration	GHRM and circular economy business models developed in bifurcated fashion	(Jabbour et al., 2019)
Employee wellbeing	Whether employees gain or lose wellbeing under environmental management remains an open question	(Jackson et al., 2011)
Social and economic sustainability	Few studies on social sustainability and economic performance; social value subsumed	(Lu et al., 2022; Miah et al., 2024)
Implementation depth	Implementation level moderate, with very few studies in this aspect	(Miah et al., 2024)
Cross-cultural and under-researched regions	Lack of comprehensive research in undeveloped countries and Asia; absence of a cross-cultural model	(Shahriari et al., 2019)

k. Implications for Managers and Policymakers

For managers, the evidence suggests that GHRM is most effective when its practices are integrated rather than implemented in isolation. Ability, motivation, and opportunity must coexist within a coherent framework (Yu et al., 2019); green training without complementary motivational and participatory mechanisms may therefore fail to produce the behavioural changes that mediate performance gains (Pham et al., 2019). Top-management support and interdepartmental learning also help facilitate employees' green behaviours (Mishra, 2017). Since effective GHRM depends on internal resources, particularly senior leaders' commitment, selecting and monitoring CEOs and top management teams for ethical and environmental conduct should form part of firms' sustainability efforts (Ren et al., 2020). Coordination between HR and corporate environmental responsibility departments is likewise important: misalignment can foster cynicism and reduce performance (Li et al., 2022). Managers should also guard against GHRM becoming an elitist practice limited to high-performing organisations (Marrucci et al., 2022).

Managers should treat the reputational risks of greenwashing as an operational concern. Greenwashing is associated with perceived corporate hypocrisy and higher turnover intentions, particularly

among environmentally educated employees (Robertson et al., 2023). It can also reduce task performance and citizenship behaviour through organisational cynicism, especially among employees with strong green values (Li et al., 2022). Environmental claims that exceed actual practice can therefore undermine workforce outcomes. Substantive implementation integrates environmental procedures into daily operations and influences business models, goals, and processes; symbolic implementation produces evidence of compliance mainly to pass an annual audit (Iatridis & Kesidou, 2016). Because symbolic and substantive actions can complement one another in building legitimacy, managers should ensure that symbolic efforts accompany rather than replace substantive practice (Berrone et al., 2009).

For policymakers, the evidence points to three priorities. First, because GHRM implementation is constrained by both external regulations and internal resource limitations (Wielewska et al., 2023), policy should reduce regulatory uncertainty while strengthening organisational capacity. This is particularly relevant in developing countries facing serious environmental concerns and weakly implemented government regulations (Mishra, 2017). Second, policy should take a human-centred approach to sustainable recovery, incorporating climate action into socio-economic renewal (Cooke et al., 2022). Third, employees' status as significant business stakeholders (Jackson et al., 2011), together with evidence linking GHRM to employee wellbeing and environmental performance to financial outcomes (Renwick et al., 2012), supports policy instruments that reward verified substantive environmental management rather than certification alone. However, implementation remains moderate, and evidence on social and economic sustainability is limited (Miah et al., 2024); the field is also still developing (Bahuguna et al., 2022). The agenda outlined above should therefore be treated as a set of researchable questions, not a settled programme.

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