E-ISSN: 2708-4523
P-ISSN: 2708-4515
Impact Factor (RJIF): 5.61
AJMC 2025; SP-6(2): 178-182

www.allcommercejournal.com
Received: 11-04-2025
Accepted: 15-05-2025

Sure Tharun Kumar
M.S. Data Science EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

C Keerthana Joy
M.S. Data Science EdTech Division Exafluence INC, Sri Venkateswara University Tirupati, Andhra Pradesh, India

Bhargavi B
M.S. Data Science EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

R Kiran Kumar
M.S. Data Science EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

Corresponding Author:
Sure Tharun Kumar
M.S. Data Science EdTech Division Exafluence INC, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

AI for green HRM: Promoting eco-conscious workplace practices and carbon footprint reduction

Sure Tharun Kumar, C Keerthana Joy, Bhargavi B and R Kiran Kumar

DOI: https://www.doi.org/10.22271/27084515.2025.v6.i2Sc.688

Abstract
The growing climate emergency calls for a change in organizational behaviour, with Human Resource Management (HRM) at the centre of driving environmental sustainability. Green HRM seeks to incorporate environmental management within conventional HRM roles to encourage eco-friendly practices and minimize organizations' footprints on the environment. This paper discusses the potential for revolutionizing Green HRM through Artificial Intelligence (AI). We examine how AI-based tools can support different Green HRM activities such as sustainable recruitment, environmentally friendly employee education and motivation, resource usage optimization (energy, water, waste), encouraging sustainable transportation, and precise carbon footprint tracking and reporting. By applying AI's strengths in data analytics, pattern detection, automation, and predictive modelling, organizations can significantly increase the effectiveness of their Green HRM practices, resulting in more effective eco-friendly workplace practices and drastic carbon footprint reductions. The paper also discusses potential pitfalls, ethical concerns, and directions for future development in AI usage in Green HRM.

Keywords: Green HRM, Artificial Intelligence, Sustainability, Carbon Footprint, Eco-conscious Workplace, Employee Engagement, Resource Optimization, Environmental Management.

1. Introduction
The need for environmental sustainability is no longer an esoteric issue but a worldwide imperative affecting all areas of society, including business firms (Renwick *et al*., 2013) [4]. Organizations are increasingly taking their role in addressing climate change and are implementing measures to lower their environmental footprint. Human Resource Management (HRM) is well placed to spearhead such a shift by championing a green organizational culture and adopting environmentally conscious practices (Opatha & Arulrajah, 2014) [3]. This has given rise to Green Human Resource Management (Green HRM), which refers to the application of HRM policies to encourage the sustainable utilization of resources in organizations and, more broadly, encourage the environmental cause (Mandip, 2012) [2].
Although Green HRM offers a solid framework, its usage and effectiveness can be enhanced using innovative technologies. Artificial Intelligence (AI), with its ability to process data, predictive analytics, automation, and personalized action, presents unparalleled opportunities to advance Green HRM practices. This paper seeks to examine the multi-dimensional uses of AI in Green HRM with an emphasis on how it can support environmentally friendly workplace practices and offer measurable carbon footprint reduction.

Fig 1: AI for green HRM

2. Literature Review

The main aim of a research paper on "AI for Green HRM" is to explore, examine, and theorize how Artificial Intelligence (AI) can be utilized to improve, mechanize, and transform Green Human Resource Management (GHRM) practices. The aim is to close the gap between two fast-growing areas—AI technology and corporate sustainability—to develop more effective, data-based, and meaningful environmental initiatives in organizations.

Key Objectives and Specific Aims

An empirical research paper on this issue would likely have as its goal a number of the following:

1. Identify and Investigate Applications (The "What")

This is an essential goal. The paper strives to determine the points of contact where AI can be applied to GHRM processes.

- Green Recruitment: How might AI-driven applicant tracking systems (ATS) parse resumes for keywords reflecting environmental experience, sustainability certifications, or a "green mindset"?
- Green Training & Development: How can AI design customized learning journeys for employees on issues such as energy saving, waste minimization, and green supply chains? Can AI-based simulations simulate the environmental footprint of business choices?
- Green Performance Management: How can AI applications monitor, quantify, and analyze employee performance against Key Performance Indicators (KPIs) related to sustainability, e.g., less travel, reduced energy usage, or contribution to green programs?
- Employee Communication & Engagement: How can chatbots powered by AI respond to employee queries on corporate environmental policies? How can Natural Language Processing (NLP) analyze survey feedback from employees to assess the sentiment of sustainability programs?
- Green Compensation & Rewards: How can AI assist in building equitable and efficient reward systems linking bonuses or praise with quantifiable environmental performance?

2. To Analyse the Impact and Effectiveness (The "So What")

The article transcends identification to judgment. It seeks to measure the real advantages of automating GHRM.

- Efficiency and Optimization: Does applying AI to the process of managing GHRM result in less resource usage (e.g., paper, energy), lower administrative expenses, and time saved?
- Better Decision-Making: Does AI-based data analysis enable managers to gain better insights to take strategic decisions that are good for the business as well as the environment (e.g., forecasting the carbon impact of various project staffing structures)?
- Cultural Shift: Does applying AI tools assist in embedding a more robust and ingrained culture of sustainability across the organization? Does it enhance employee consciousness and initiative- taking green behaviour?

3. Construct a Conceptual Framework or Model (The "How")

This is a higher-level objective, seeking to build new knowledge.

- The paper may suggest a theoretical model that describes how AI uptake, GHRM practices, employee action, and corporate environmental performance interact.
- It may outline a practical model of implementation—a series of steps in the instruction manual for HR managers on how to choose, implement, and deploy AI instruments for their GHRM plan.

4. Identify Challenges, Risks, and Ethical Considerations (The "But")

A good research paper has a critical mindset. The aim is not only to promote AI but to recognize its limitations.

- Algorithmic Bias: Might AI instruments in green hiring penalize candidates from groups with fewer formal environmental education exposures?
- Data Privacy: What are the data privacy implications of applying AI to track employee behaviour (e.g., monitoring energy consumption at workstations)?
- Displacement of Jobs: Will GHRM task automation displace HR professionals? What new competencies will be needed?
- Implementation Barriers: What are the technical issues, costs, and organizational resistance to implementing these innovative technologies?

3. Green HRM: A Foundation for Corporate Sustainability

Fig 2: Green Human Resource Management

Green HRM involves a set of practices throughout the employee life cycle to develop an environmentally conscious and sustainable workforce. Some of the main Green HRM activities include:

- **Green Recruitment and Selection**: Sourcing and selecting employees with environmental awareness and sustainability expertise.

- **Green Training and Development**: Training employees with environmental knowledge, sustainable practices, and how they can contribute to the green objectives of the organization.
- **Green Performance Management and Rewards:** Linking environmental performance to appraisal processes and rewarding green behaviours.
- **Green Employee Involvement and Engagement**: Encouraging a culture of active employee involvement in green activities and sharing green ideas for environmental gain.
- **Green Compensation and Benefits:** Providing benefits in support of sustainable living (e.g., public transport allowances, cycle-to-work schemes).
- **Green Workplace Design**: Designing workplaces that reduce resource usage and enhance well-being.

These practices together seek to minimize an organization's ecological impact, increase its reputation, boost employee morale, and result in cost savings (Arulrajah *et al*., 2015) [1].

4. The Role of AI in Enhancing Green HRM Practices

AI can function as a powerful catalyst for Green HRM, transforming traditional approaches into more data-driven, efficient, and impactful strategies.

1. AI-Powered Carbon Footprint Monitoring and Analysis

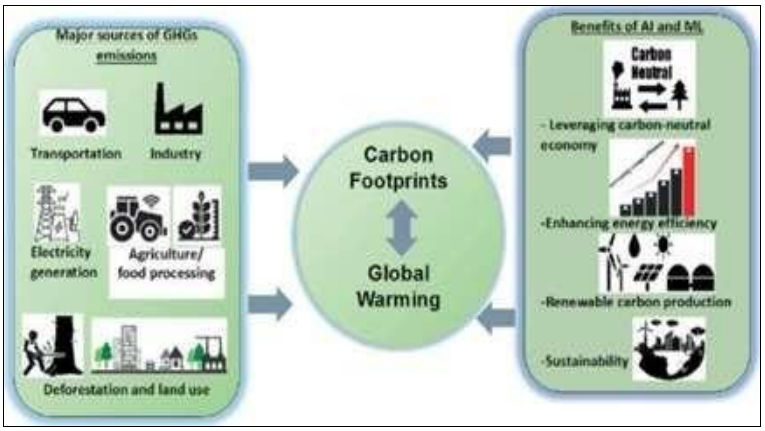

Fig 3: AI-Powered Carbon Footprint Monitoring & Analysis

- **Automated Data Collection:** AI applications can be integrated with IoT sensors and smart meters to automatically capture real-time data on energy usage, water use, waste production, and business trips.
- **Advanced Analytics & Prediction:** Machine learning algorithms analyze this data to spot patterns, consumption hotspots, and forecast future carbon emissions according to operational plans. This makes initiative-taking intervention possible.
- **Scope 1, 2, and 3 Emissions Tracking:** AI can assist companies in tracking and reporting Scope 3 emissions (value chain indirect emissions) more accurately, which tend to be the largest and most difficult to measure.

2. Optimizing Resource Consumption

Fig 4: Optimizing Resource Consumption

- **Intelligent Building Management**: AI-based building management systems can maximize HVAC (heating, ventilation, and air-conditioning), lighting, and other energy-intensive systems depending on occupancy, weather, and energy price signals, resulting in substantial energy savings.
- **Waste Reduction and Management**: Image recognition using AI can enhance waste sorting efficiency in recycling plants. Predictive analytics can streamline waste collection schedules and detect areas for reducing waste at its source.
- **Water Management:** AI can track water consumption, identify leaks, and optimize irrigation systems within corporate campuses.

3. Promoting Eco-Conscious Employee Behaviour and Engagement

- **Personalized Feedback and Nudges**: AI may give employees individualized feedback on their consumption of resources (e.g., energy usage at their desk, printing) and provide personalized suggestions or "nudges" to promote greener behaviours.
- **Gamification of Sustainability**: AI can drive gamified platforms that incentivize green challenges (e.g., waste-saving contests, sustainable transportation challenges), monitor progress, and reward environmentally friendly behaviour.
- **AI-Driven Training and Awareness**: AI- based learning platforms can provide tailored environmental training modules, responding to the learning speed and the areas of knowledge gaps, thus making green

education more efficient and interactive.

4. **Facilitating Sustainable Commuting and Remote Work**

- **Optimized Commute Estimates:** AI estimates can be used to analyze employee location data (with consent and anonymized) and public transport schedules to provide optimized carpooling routes or public transport, minimizing commute emissions.
- **Measuring Remote Work Effects:** AI can aid in projecting the environmental advantages (e.g., lower commuting emissions, office energy efficiencies) and downsides (e.g., higher home energy consumption) of remote and hybrid work arrangements and guide policymaking.

5. **Green Recruitment and Talent Development**

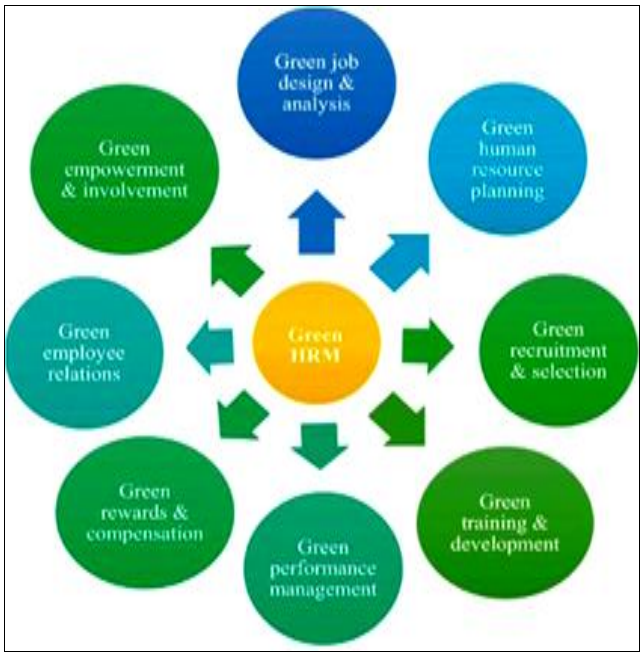

Fig 5: Green Recruitment & Talent Development

- **Recruitment of Sustainability Champions:** AI applications may scan resumes and online profiles for candidates who have shown interest, knowledge, or experience in sustainability, and assist the HR department in hiring people with the same vision as the green company.
- **Green Competency Gap Analysis**: AI can assist in determining gaps in current employees' green skills and propose personalized training programs to enhance employee competency for green jobs and roles.

6. **Streamlining Sustainability Reporting and Compliance**

- **Automated Report Generation**: AI can automate data gathering and aggregation of environmental information, making it much easier to create sustainability reports needed by stakeholders and governments (e.g., GRI, TCFD).
- **Compliance Assurance**: AI machines can monitor changing environmental legislation and assist businesses in ensuring that they continue in compliance, escaping fines and brand harm.

5. Challenges and Ethical Considerations

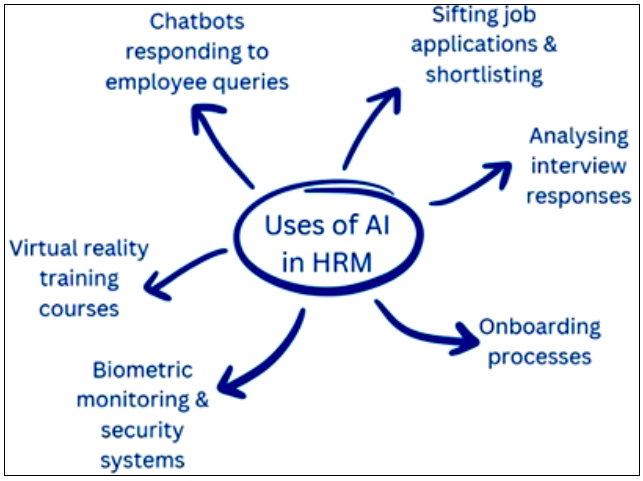

Fig 6: Uses Of AI in HRM

However, the utilization of AI in Green HRM comes with its own set of challenges:

1. **Data Security and Privacy**: Gathering and analysing employee data for Green HRM presents serious privacy issues. Strong data stewardship, anonymization methods, and open communication regarding data usage are important.
2. **Implementation Cost:** The up-front cost of AI technology, infrastructure, and trained staff can be high, especially for SMEs.
3. **Bias in Algorithms:** AI algorithms have the potential to reinforce current biases if they are not well designed and audited, thus translating into discriminatory results in hiring or performance reviews for green initiatives.
4. **Trust and Resistance from Employees:** The employees could be apprehensive of greater monitoring or feel that AI interventions are intrusive. Establishing a sense of trust through open communication and an emphasis on empowerment over control is paramount.
5. **Change Management and Skill Gap:** HR employees and professionals might not have the appropriate skills to perform efficiently using AI technologies. Proper training and change management strategies are required.
6. **Too Much Dependence on Technology:** AI should complement, not substitute for, human intuition and moral judgment in Green HRM. The human aspect of empathy, involvement, and leadership is essential.

6. Future Directions

The integration of AI and Green HRM is in its initial stages, with several promising future directions:

- **Explainable AI (XAI) in Green HRM:** Creating XAI models that can explain their suggestions in simple terms, making the decisions made by AI-based Green HRM more transparent and trustworthy.
- **Predictive Analytics for Initiative-taking Green Interventions:** Augmenting the predictive capability of AI to anticipate environmental threats or opportunities, enabling organizations to take initiative- taking steps.
- **AI for Circular Economy Integration:** Applying AI to determine opportunities for product lifecycle

extension, material reuse, and closed-loop systems, further integrating sustainability into the organization.

- **Integration with Broader ESG Goals:** Extending AI applications to enable broader Environmental, Social, and Governance (ESG) goals, with Green HRM being an essential part.
- **Development of Standardized AI-Green HRM Frameworks**: Designing sector- specific frameworks and best practices for effectively and ethically implementing AI in Green HRM.

7. Conclusion

Artificial Intelligence provides a revolutionary framework for organizations to take their Green HRM practices from good intentions to highly effective, evidence-based methods. By leveraging the strengths of AI in data analysis, automation, customization, and forecasting, organizations can create truly environmentally conscious workplaces, enable employees to become co-actors for environmental transformation, and reduce their carbon footprint drastically. Whereas issues of cost, ethics, and capabilities need to be tackled urgently, the prospective advantages of applying AI to Green HRM are immense. As global organizations seek to achieve world-leading climate objectives, the strategic usage of AI in defining greener human resource strategies will become progressively crucial for constructing a sustainable future.

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