# Mihai-Bogdan Atanasiu • Anca-Diana Bibiri • Emanuel Grosu • Alina Moroşanu • Constantin Răchită

(Editors)

# **CULTURAL DYNAMICS OF VALUES**



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# Green Jobs, Green Skills and Green Human Resource Management. An Analysis of Current Trends

SILVIA-MARIA CARP\*; ANA-MARIA BERCU\*\*

**Abstract:** This paper aims to conduct a bibliometric analysis of the literature in the field of green jobs to identify the main trends, developments and research directions in this area. In the context of the transition to a green economy, green jobs are becoming more and more common and the demand for green skills is increasing significantly. Along with this is the concept of Green Human Resource Management, which plays a key role in supporting this process through the development of green recruitment, training and development policies. The results of our analysis highlight that the most addressed concept according to the papers that have been the subject of our analysis is Green Human Resource Management and how it influences the pro-environmental behaviour of employees. The obtained results highlight the need to adapt educational and HR strategies.

**Keywords:** Green jobs; Green human resource management; Green skills; Just transition; Bibliometric analysis.

#### Introduction

The year 2021 marked the European Union's adoption of its first European climate law, setting EU targets to become climate neutral by 2050 and to reduce carbon emissions by 55% by 2030. Three years later, in February 2024,

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the European Commission recommended an additional intermediate target of a 90% reduction by 2040¹.

Climate neutrality could not be achieved without green jobs. This concept of green jobs has gained increasing attention in recent years, with a growing emphasis on helping workers develop new skills to thrive in a green economy. According to a report by LinkedIn, from 2015 through 2023, employment in the renewable energy sector has marked an increase. For every 100 employees who left the renewable energy sector, 120 chose to enter it. This transition is leading to increased green skills in many industries, even more so in those with higher carbon consumption<sup>2</sup>. The International Labor Organization defines green jobs as decent positions that contribute to preserving and restoring the environment, either in traditional industries such as manufacturing and construction or in emerging green industries such as renewable energy and energy efficiency. The professions mentioned above require a wide range of skills and knowledge in a variety of fields, from research and development to engineering, architecture, project management, auditing or knowledge in traditional jobs such as plumbing or electrical work<sup>3</sup>.

After analyzing 15.000 jobs found on LinkedIn, according to the intensity of green skills they require, these fall into four broad categories: *green jobs* are those jobs that cannot be performed without an in-depth knowledge of green skills; *greening jobs* that could be performed without green skills but usually require some skills; *greening potential jobs* can be performed without technological skills but require at least some technological skills; *non-green jobs* do not require any technological skills<sup>4</sup>.

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<sup>&</sup>lt;sup>1</sup> European Commission, "The European Green Deal. A growth strategy that protect the climate", Available at: <a href="https://ec.europa.eu/stories/european-green-deal/">https://ec.europa.eu/stories/european-green-deal/</a> [Accessed: 10 Sept. 2024].

LinkedIn, "Global Skills Report", 2023, 5. Available p. https://economicgraph.linkedin.com/research/global-green-skills-report [24 Jun. 2024]. <sup>3</sup> ILO, "Defining and measuring remote work, telework, work at home and home-based work", 2013. Available https://webapps.ilo.org/global/statistics-andat: databases/publications/WCMS 747075/lang--en/index.htm [Accessed: 04 Jun. 2024]. LinkedIn. "Global Green Skills Report", 2022. Available https://economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/globalgreen-skills-report/global-green-skills-report-pdf/li-green-economy-report-2022.pdf.

At the European Union level, the *European Classification of Occupations, Skills and Competences* (ESCO) database is the common tool for classifying jobs, being a classification of skills, competencies and occupations. The European Commission distinguishes between green skills which lessen the impact of human activities on the environment, while skills which do not affect the environment and brown skills which increase the impact of activities on the environment. Green skills according to the ESCO classification are information, assistive and caring, handling and moving, construction, communication, collaboration and creativity, management, and those involving working with specialized machinery and equipment<sup>5</sup>.

Through this paper, we aim to carry out a bibliometric analysis of the literature on green jobs, with the main objective of identifying the main trends, developments and research directions in this field. Using this analysis we aim to identify the most studied topics related to our concept, thus providing an overview of how this concept has evolved and facilitating a deeper understanding of the challenges and opportunities towards a just transition.

The paper is structured as follows: in section 2 we review the literature. Section 3 will present the methodology used to carry out the bibliometric analysis, more precisely the steps taken to obtain the final map. The last two sections will focus on the discussion of the results obtained, related to the literature review and the conclusions of the paper.

## Literature review

The transition to a green economy generates continuous dynamics in the supply and demand side of the labour market, thus affecting the demand for skills and job quality by increasing demand for some jobs and decreasing demand for others, i.e. adapting existing occupations to new environmental requirements. Moreover, new economic activities contribute

<sup>&</sup>lt;sup>5</sup> European Commission, *Green Skills and Knowledge Concepts: Labeling the ESCO classification*, 2022. Available at: <a href="https://esco.ec.europa.eu/ro/about-esco/publications/publication/green-skills-and-knowledge-concepts-labelling-esco">https://esco.ec.europa.eu/ro/about-esco/publications/publication/green-skills-and-knowledge-concepts-labelling-esco</a>
[Accessed: 24 Jun. 2024].

to the creation of new occupations, which require updated skills and training frameworks<sup>6</sup>.

Human resource management plays an important role in achieving environmental goals as well as in shaping the green behaviour of the workforce7. At the organizational level, creating a pro-environmental attitude is very much part of Green Human Resource Management (GHRM). GHRM promotes green recruitment, training and development that aligns employees with the organization's sustainability goals. Yong et al. show that GHRM practices such as green recruitment and training significantly improve environmental performance and help promote a green organizational culture8. The study by Amjad and his collaborators shows that employee performance can be greatly improved through green training and development, with a small but significant employee effect9. Promoting high levels of performance among employees would require organizations to take steps to examine the use and waste of resources used and put in place green management systems to design an efficient workflow<sup>10</sup>. In this context, the concept of green training needs to be raised. Green training is an essential approach when we talk about equipping employees with skills to minimize environmental challenges and align

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performance", Environmental Science and Pollution Research, 28(22), 2021.

<sup>&</sup>lt;sup>6</sup> CEDEFOP, "Green skills and environmental awareness in vocational education and training", 2012. Available at: <a href="https://www.cedefop.europa.eu/en/publications/5524">https://www.cedefop.europa.eu/en/publications/5524</a> [Accessed: 29 Aug. 2023].

<sup>&</sup>lt;sup>7</sup> J. Dumont, J. Shen and X. Deng, "Effects of Green HRM Practices on Employee Workplace Green Behavior: The Role of Psychological Green Climate and Employee Green Values", *art. cit.*, p. 613.

<sup>&</sup>lt;sup>8</sup> J. Y. Yong, M. Yusliza, T. Ramayah, C.J. Chiappetta Jabbour S., Sehnem, and V. Mani, "Pathways towards sustainability in manufacturing organizations: Empirical evidence on the role of green human resource management", *art. cit.*, p. 11. <sup>9</sup> F. Amjad, W. Abbas, M. Zia-UR-Rehman, Baig S.A., M. Hashim, A. Khan and H. Rehman, "Effect of green human resource management practices on organizational sustainability: the mediating role of environmental and employee

<sup>&</sup>lt;sup>10</sup> A. A. Arulrajah, H.H.D.N.P., Opatha, and N. N. J. Nawaratne, "Green human resource management practices: a review", *Sri Lankan Journal of Human Resource Management*, 5(1), 2016, pp. 1-16.

company policies with the strategies designed to protect the environment<sup>11</sup>. Green training involves educating employees on energy conservation, managing resources provided to the environment, reducing waste and encouraging awareness of environmental issues<sup>12</sup>.

Education and training have an important role to play in the skills needed for green jobs. Looking from the perspective of adapting to the needs of the market and industries, one of the issues to be considered in adopting a stakeholder-driven strategy<sup>13</sup>. Blewitt argues that lifelong learning and formal higher education will need to adapt and adopt many of the practices evident in other fields to be suitable for use in a greener knowledge-based economy. A university graduate who leaves with a set of attributes based on ecocentric and sustainable values will not only fulfil his or her function for industry but will also serve a moral purpose in a world that has already entered an ecologically critical phase<sup>14</sup>. Feng and Yang point out that national strategies to encourage advanced human capital not only contribute to economic growth but can also mitigate the effects of climate change. As an alternative to adopting climate change rules and regulations to address the problem, it may be more efficient and less distortionary to invest in highly skilled human capital. Based on their study, they determined that investments in human capital have significant social externalities, including environmental protection, that are beneficial to society.

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<sup>&</sup>lt;sup>11</sup> O. Ercantan and S. Eyupoglu, "How Do Green Human Resource Management Practices Encourage Employees to Engage in Green Behavior? Perceptions of University Students as Prospective Employees", Sustainability, 14(3), 2022, p. 1718.

<sup>&</sup>lt;sup>12</sup> H, Sun, G.M. Bahizire, J. Baptiste and T. Chen, "Enhancing Employee Green Performance through Green Training: The Mediating Influence of Organizational Green Culture and Work Ethic in the Mining Sector", *Journal of cleaner production*, 449, 2024.

<sup>&</sup>lt;sup>13</sup> A. P. McCoy, P. O'Brien, V. Novak and M. Cavell, "Toward Understanding Roles for Education and Training in Improving Green Jobs Skills Development", *International Journal of Construction Education and Research*, 8(3), 2012, pp. 186-203.

<sup>&</sup>lt;sup>14</sup> J. Blewitt, "Higher education for a sustainable world", *Education* + *Training*, 52 (6-7), 2010, pp. 477-488.

## Materials and methods

This paper is based on a review of the literature in the field of jobs see using data from the Web of Science database.

For the bibliometric analysis, we used articles published in the international database Web of Science, and the reason for choosing this database is the quality of the studies indexed in this database. The bibliometric analysis was carried out with data from 2010-2024, and the keywords after which the search was performed were "green jobs". The types of documents included in the analysis were articles, proceeding papers, review articles, book chapters, early access or books. The language selected was English and the subject areas were business economics, environmental sciences ecology, engineering or science technology, computer science or energy fuel. We excluded from our analysis studies in fields far removed from our analysis, such as studies in medicine, chemistry etc. Our search returned a total of 2670 studies. The next step was to export the complete WoS records in Plain Text File format. Since Web of Science does not allow the export of more than 1000 studies, we proceeded to export three files, which were then merged to obtain our database. The analysis was performed with RStudio using Bibliometrix R and biblioshiny. Bibliometrix R provides a set of tools for bibliometrics or scientometrics research and is written in the R language which consists of an open-source environment and eco-system<sup>15</sup>. The results obtained from the analysis detailed above will be analyzed in the following section, dedicated to the presentation of the results and the discussion on them.

#### Results and discussions

The most cited papers can be found in Figure 1. Bissing-Olson et al. studied the links between daily effects and employees' pro-environmental behaviour at work, and their results indicate that when employees feel relaxed and content, their environmental behaviour in daily tasks at work is influenced. Thus, the authors of the study suggest that organizations can

<sup>&</sup>lt;sup>15</sup> M. Aria, C. Cuccurullo, "Bibliometrix: An R-tool for comprehensive science mapping analysis", *Journal of Infometrics*, 11, 2017, pp. 959-975.

promote green behaviours in the workplace by cultivating positive attitudes towards the environment and fostering a positive emotional climate<sup>16</sup>. In line with the aforementioned study is the study by Kim and his collaborators. They explored how voluntary workplace environmental behaviour of employees and leaders is influenced. The study findings show that conscientiousness and moral reflection are important predictors of employees' voluntary environmental behaviour. In terms of leaders' voluntary environmental behaviour, it directly influences subordinates' voluntary environmental behaviour. Thus, leaders who exhibit green behaviours lead subordinates to follow their example<sup>17</sup>. Norton et al. explored green behaviour in employees, drawing on a multi-level conceptual model based on person-environment interaction, job performance and motivational theories, to lay the foundations for a theoretical analysis of green behaviour. The authors distinguished between required and voluntary environmental behaviour, which depends on employee initiative, and identified factors that influence employees' environmental behaviour, such as those at the institutional, organizational (organizational policies), leader (leadership style), team (group norms) and employee (individual attitudes towards the environment) levels18. GHRM encompasses practices that are designed to align routine human resource activities, such as recruitment, training and performance management, with environmental sustainability goals<sup>19</sup>. The study by Dumont and colleagues explores the impact that GHRMs have on employees' workplace environmental behaviour, both in formal work tasks (in-role behaviour) and

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<sup>&</sup>lt;sup>16</sup> M.J. Bissing-Olson, A. Iyer, K.S. Fielding and H. Zacher, "Relationships between daily affect and pro-environmental behavior at work: The moderating role of pro-environmental attitude", *Journal of Organizational Behavior*, 34, 2012, pp. 156-175.

<sup>&</sup>lt;sup>17</sup> A. Kim, Y. Kim K., Han S. E., Jackson, and R. E. Ployhart, "Multilevel influences on voluntary workplace green workplace behavior: individual differences, leader behavior, and coworker advocacy", *Journal of Management*, 43, 2014, pp. 1335-1358.

<sup>&</sup>lt;sup>18</sup> T. A. Norton, S. L. Parker, H. Zacher and N. M. Ashkanasy, "Employee green behavior", *Organization & Environment*, 28, 2015, pp. 103-125.

<sup>&</sup>lt;sup>19</sup> J. Y. Yong, M. Yusliza, T. Ramayah, C. J. Chiappetta Jabbour, S. Sehnem and V. Mani, "Pathways towards sustainability in manufacturing organizations: Empirical evidence on the role of green human resource management", *Business Strategy and the Environment*, 29(1), 2019, pp. 212-228.

in extra-role activities (extra-role behaviour). The results of their analysis indicate that GHRMs both directly and indirectly influence environmental behaviour in formal work tasks and only indirectly influence behaviour in extra-role tasks. They highlight the importance of green HR practices when it comes to employee behaviour, showing that these practices can help organizations achieve their sustainability goals by implementing a green psychological climate and engaging employees in green activities<sup>20</sup>. Another important factor in pro-environmental behaviour in the workplace is empathy. Tian and Robertson found that employees who perceive their organizations to be pro-environment are more likely to identify with the organization they belong to, with this attitude only present for employees who demonstrate moderate to high levels of empathy<sup>21</sup>. As we can see, most of the articles in our analysis deal with the topic of GHRM, which indicates that this is a topic that is of quite high interest to researchers.

Another topic addressed in the papers in the above analysis is that of just transition. This has developed through the efforts of trade unions to protect workers affected by environmental policies and energy transition<sup>22</sup>. The just transition concept integrates three types of justice, namely climate justice, energy justice and environmental justice. Just transition is the fair process by which societies move from a carbon-based to a low-carbon economy. A just transition must ensure that the burden of the energy transition is distributed equitably while protecting human rights and avoiding the amplification of existing social inequalities<sup>23</sup>.

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<sup>&</sup>lt;sup>20</sup> J. Dumont, J. Shen and X., Deng, "Effects of Green HRM Practices on Employee Workplace Green Behavior: The Role of Psychological Green Climate and Employee Green Values", *Human Resource Management*, 56(4), 2016, pp. 613-627.

<sup>&</sup>lt;sup>21</sup> Q. Tian, and J. L., Robertson, "How and When Does Perceived CSR Affect Employees' Engagement in Voluntary Pro-environmental Behavior?", *Journal of Business Ethics*, 155(2), 2017, pp. 399-412.

<sup>&</sup>lt;sup>22</sup> X. Wang, and K. Lo, "Just transition: a Conceptual Review", Energy Research & Social Science, 82, 2021.

<sup>&</sup>lt;sup>23</sup> R. J. Heffron, and D. McCauley, "What is the 'Just Transition'?", *Geoforum*, 88, 2018, pp. 74-77.

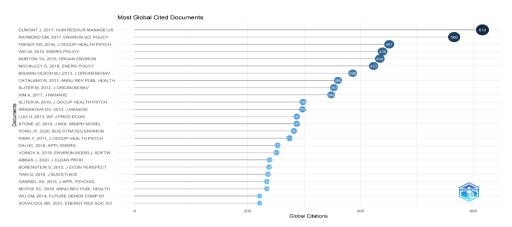


Figure no. 1. Most globally cited documents Source: own computation

McCauley and Heffron address the concept of just transition in their paper, seeking to unify climate, energy and environmental justice, while also addressing issues of equity and justice in the context of the transition away from fossil fuels. The authors of the study propose that the term just transition be used to include not only green jobs issues but also global environmental and social equity challenges<sup>24</sup>.

The last analysis performed is the keyword co-occurrence network (Figure no. 2). Each cluster of terms represented by a different colour represents correlated themes. Thus, the green cluster presents terms related to sustainable development, green economy, renewable energy and just transition. The terms "sustainable development", "green jobs" and "renewable energy" represent the central or dominant concepts in our analysis.

The second cluster is the red one, containing terms such as "energy efficiency", "cloud computing" or "green computing", which shows that there is a close link between ICT and energy optimization in the context of the transition to a green economy. The last cluster, the blue one, contains concepts such as "green human resource management", "job satisfaction" or "corporate social responsibility" which are part of the human resources and

<sup>&</sup>lt;sup>24</sup> D. McCauley, and R. Heffron, "Just transition: Integrating climate, energy and environmental justice", *Energy Policy*, 119, 2018, pp. 1-7.

workplace performance domain and is the cluster containing the most cited papers according to the analysis carried out above.

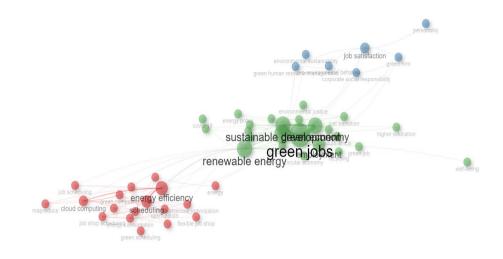


Figure no. 2. Co-occurrence network Source: own computation

#### Conclusions

Our bibliometric analysis highlights the growing interest in green jobs and their role in the current context, emphasizing the diversity and complexity of these jobs which require a wide range of skills, from specific technological skills to management or human resources competencies. One of the key issues identified is the need to develop green skills in the workforce through continuing education and specific training. GHRM is proving to be an essential element in achieving sustainability goals, significantly impacting organizational performance and the proenvironmental behaviour of employees.

To support this green transition, it is essential that education and human resources policies adapt rapidly to the new skill requirements and that organisations put more emphasis on development strategies aligned with global sustainability goals.

## Research limitations

Our research provides an overview of the literature on green jobs and current trends. The limitations of our research are determined by several factors, among which we mention the size of the database and the fact that only articles from the Web of Science database were extracted, without considering those from the Scopus database.

Future research directions will involve a more detailed literature review, using data from both WoS and Scopus, to gain a more comprehensive picture of the topics covered in the literature.

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