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ANTECEDENTS OF ACQUIRING AND DEVELOPING GREEN MANAGERIAL COMPETENCES – INSIGHTS FROM THE PERSPECTIVE OF ENTREPRENEURS AND DISTRICT LABOUR CEOs

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ABSTRACT: Purpose: Growing ecological, social, and regulatory pressures make acquiring green managerial competences essential for building competitive advantage. This study aimed to identify the antecedents of acquiring and developing green managerial competences from the perspectives of literature findings, District Labour CEOS, and entrepreneurs operating in the Silesia Region. Methodology: The study employed Principal Component Analysis (PCA) to analyse data from the survey (based on 71 structured questionnaires) conducted in May 2024 with District Labour Office CEOs and entrepreneurs in the Silesia Region. Findings: The findings contribute to the conceptualisation of green managerial competences, providing a basis for more precise definitions in future research. Respondents define these competences broadly, including green economy skills and personal, social, and interpersonal competences. Five key antecedents were identified: organisation, competition, self-development, socio-economic changes, and job loss, which significantly influence the achievement of organisations' competitive advantage, particularly in the context of the economy's transition towards sustainable development. Practical and social implications: Insights from the study guide managers in developing competences crucial for navigating the transition to a sustainable economy. Emphasising green competences promotes sustainable development and aligns organisational strategies with societal goals. Originality: This study addresses a research gap by enhancing the understanding of green managerial competences and identifying key factors influencing their development.

KEYWORDS: Silesia Region, green economy, green competences, green management

Introduction

Developing green managerial competences is becoming a crucial element for businesses to adapt to the growing ecological, social, and regulatory pressures. Modern companies operate in an environment where the climate crisis, environmental degradation, and depletion of natural resources necessitate radical changes in management approaches. Managers who can implement innovative, eco-friendly solutions and sustainable business models become invaluable assets for organisations striving to survive and succeed in the changing economic landscape. Equipping management with skills aligned with sustainable development principles not only enables companies to meet increasingly stringent legal requirements but also helps build a competitive advantage, increase operational efficiency, minimise climate-related risks, and attract and retain the most talented employees.

Despite these clear benefits, developing green managerial competences remains an underexplored and underdeveloped area of management. Although there is a growing body of literature on green managerial competences, significant research gaps still exist in both theoretical and practical dimensions. A notable gap is the comprehensive understanding and integration of green competences within Green Human Resource Management (GHRM). While existing research emphasises the importance of green competences in promoting sustainable business practices, there is no consensus on the exact nature of these competences or the systematic ways to develop and measure them in various organisational contexts (Sulich & Kozar, 2024). Additionally, an analysis of available literature indicates a significant research gap in identifying the drivers for acquiring and developing green managerial competences. Although the topic of green competences is increasingly studied in the context of human resource management and sustainable development, detailed research focusing on managers' motivation to acquire and refine these competences is lacking. Most studies focus on general aspects of motivation for green actions in organisations, such as research on motivational tools used in Ukrainian organisations, which suggests that motivating employees for green actions is not yet widespread, and existing motivational systems are relatively underdeveloped (Tsymbaliuk et al., 2022). While some studies touch on green motivation in a broader context, a detailed understanding of the factors that condition managers to develop green competences is still insufficiently researched. An example is a study that analyses the impact of GHRM practices on the development of organisational competences but focuses on the effects of these practices rather than the motivation to implement them (Dalla Valle et al., 2024). Therefore, there is a need to deepen research on managers' motivation to acquire green competences, which could provide valuable insights for more effective implementation of sustainable practices in organisations.

The aim of the study was to identify the antecedents of acquiring and developing green managerial competences from the perspectives of literature findings, District Labor CEOs, and entrepreneurs. The study sought to verify whether the theories and hypotheses proposed in the literature are confirmed by the actual judgments of the study participants. The objective was to assess the alignment between theory and practice and to identify new factors influencing engagement in the development of green managerial competences.

To address the existing gaps, the primary objective of this article was to explore and answer the following research questions:
1. To what extent are respondents familiar with the concept of green managerial competences, and how accurately can they identify specific competences associated with this concept?
2. What are the main determinants that motivate managers and organisational leaders to acquire and develop green managerial competences?
3. Are managers and organisational leaders interested in acquiring and developing green competences in the future?

For a better understanding of the content, the article has been divided into the following five sections. An introduction of the topic, the aim of the research and the authors' original contributions are included in Section 1. Section 2 provides an overview of the literature on the development of employee competences in organisations, especially considering matters related to green managerial competences and the main determinants of their acquisition and development. Section 3 describes the methodology used in the paper and Section 4 presents the obtained results discussed in the context of the existing literature. The article ends with conclusions, identification of limitations and suggestions for further research (Section 5).

An overview of the literature

The conceptualisation of green managerial competences presents a significant challenge due to the lack of a clear definition and the difficulty in determining which components should be included in this concept. Green competences are increasingly seen as critical elements in pursuing sustainable initiatives that align corporate strategies with environmental goals, essential for the long-term success of organisations and ensuring compliance with legal regulations. However, the diversity of contexts in which green competences are applied makes their definition ambiguous. For instance, Ahmad (2015) suggests that green competences may include skills related to energy management, emission reduction, and understanding dynamic environmental regulations. This diversity leads to difficulties in creating universal frameworks applicable across various industries and geographical regions.

There is a significant lack of consensus among researchers regarding the exact components that should be included in the definition of green managerial competences. Different approaches focus on various aspects, from technical skills like managing sustainable production to softer elements such as the ability to inspire employees to engage in pro-environmental actions. Studies emphasise (Dzhengiz & Niesten, 2020) that green competences must encompass both technical environmental management skills and interpersonal abilities, which allow managers to effectively implement pro-environmental practices within organisations. Mustapha et al. (2017) emphasise that Sustainable Environmental Management Systems (SEMS) represent a comprehensive approach to organisational sustainability, integrating environmental management, social responsibility, and economic resilience. In this perspective, green competences play a crucial role in operationalising these systems, underscoring their importance in the process of organisational sustainable development.

In the corporate context, Ali et al. (2023) analyse the direct impact of green competences on corporate sustainability performance, examining how these competences, supported by top management and embedded in a green organisational culture, significantly enhance sustainability efforts. The literature reveals various approaches to defining these competences, focusing on different aspects – from technical knowledge and analytical skills to ethics and understanding the environmental impact of organisational actions (Renwick et al., 2013). Gadomska-Lila et al. (2023) indicate that green competences are key to fostering pro-environmental behaviours and maintaining a competitive edge, especially in the context of organisational sustainability.

Another challenge lies in the diversity of industries and sectors where green competences are developed. For example, in the energy sector, these competences may involve knowledge of renewable resource management and energy efficiency, while in the manufacturing sector, they may focus on waste reduction and process optimisation (Chen & Chang, 2013). These differences make creating a single, universal model of green competences challenging, requiring researchers and practitioners to consider the specific industry context when defining and developing these skills. Additionally, a study by Grigorescu et al. (2023) on developing a green competency matrix offers a structured framework for implementing sustainable development policies in organisations, considering competences related to compliance, ethics, and sustainability reporting. Finally, Ullah et al. (2024) explore how an organisation's readiness for eco-innovation affects sustainability performance, particularly in the context of exporting firms, highlighting the importance of internal preparedness and the integration of external knowledge to improve eco-innovation and achieve better sustainability outcomes. Table 1 presents the author's synthesis of the research construct Green Managerial Competence based on recent literature.

Table 1. Overview of selected studies on green competences, considering the main determinants influencing their acquisition and development

No.	Study	Focus	Research Limitations	Types of Competences Studied	Main Antecedents for Developing Green Managerial Competences
1	The contributions of green people management to the development of organisational competences for sustainability (Dalla Valle et al., 2024)	Green HRM supports the development of strategic sustainability competences	Focus on Brazilian firms, limited generalization to other countries and sectors	Green strategic organisational competences, systemic sustainability competences	Minimizing environmental impact, improving operational efficiency, meeting regulatory and social expectations
2	The influence of green human resource management practices and employee green behavior on business performance in sustainability-focused organisations (Mehrajunnisa et al., 2022)	Green employee behaviors improve business outcomes	Study focused on UAE, limited global representativeness	Green employee and organisational behaviors	Enhancing business performance, achieving sustainability goals, and gaining competitive advantage
3	The simultaneous effect of green ability-motivation-opportunity and transformational leadership in environment management: the mediating role of green culture (Rizvi & Garg, 2020)	Green culture mediates organisational outcomes	Limitations from the industry (study conducted in India's oil and gas sector)	Green managerial and leadership competences	Enhancing environmental efficiency, fostering a green organisational culture
4	The Factors that Influences Motivations in Green Supply Chain Management Practices Towards Organisation Performance (Shariff, 2017)	Legitimacy and environmental concern motivate green practices	Study limited to firms in Malaysia, small sample size (97 organisations)	Green supply chain management competences	Complying with regulations, improving operational efficiency, meeting social responsibility expectations
5	Employee Motivation for Sustainable Entrepreneurship: The mediating role of green HRM (Yadav et al., 2023)	Green HRM supports sustainable entrepreneurship	Lack of longitudinal data, study based on a limited range of industries	Sustainable entrepreneurship competences, employee motivations	Supporting sustainable entrepreneurship and innovation, attracting talent committed to sustainability
6	Analysis and Development of Occupational Competences of 21st Century Managers of Municipal Sector (Spychała, 2014)	Managerial competences in the municipal sector must address the needs of green transformation	Study focused on the municipal sector of Wielkopolska, limited generalization	Technical and social managerial competences, environmental awareness	Promoting green resource management, supporting sustainable development in municipalities
7	Green Competences: Construct Development and Measurement Validation (Cabral & Dhar, 2019)	Development of a measurement tool for green competences, covering knowledge, skills, attitudes, and environmental awareness	Study limited to the Indian service sector, lack of applicability to other sectors	Professional green competences, environmental awareness, professional skills	Developing competences that promote sustainability and eco-friendly activities, raising environmental awareness
8	Impact of Environmental Leadership on Environmental Behavior: The Mediating Effects of Green Culture, Environmental Management, and Strategic Corporate Social Responsibility (Fan & Chung, 2023)	Environmental leadership positively influences green behavior through green culture and strategic CSR	Study based in China, limited generalizability to other regions	Green leadership competences, strategic CSR, green culture	Enhancing environmental behavior and sustainability practices, fostering a green organisational culture

No.	Study	Focus	Research Limitations	Types of Competences Studied	Main Antecedents for Developing Green Managerial Competences
9	Development of a Green Competency Matrix Based on Civil Servants' Perception of Sustainable Development Expertise (Grigorescu et al., 2023)	Green competency matrix enhances sustainable development expertise among civil servants	Focus on public sector employees, may not be fully applicable to the private sector	Green competences, sustainable development expertise	Strengthening sustainable practices in public administration, promoting sustainability through skill development
10	Individual competences for managers engaged in corporate sustainable management practices (Wesselink et al., 2014)	Identifies key competences for managers involved in corporate sustainability practices	Focus on managers in European companies, may not be fully applicable to non-European contexts	Managerial competences, sustainable management practices	Supporting corporate sustainability initiatives, enhancing managerial sustainability competences
11	The effect of green competences and values on carbon footprint on sustainable performance in the healthcare sector (Reda Shaker et al., 2024)	Green competences and values significantly reduce the carbon footprint and enhance sustainable performance in healthcare	Focus on the healthcare sector, may not be fully generalizable to other industries	Green competences, sustainable values	Reducing carbon footprint, improving healthcare sustainability
12	Green Knowledge Management to Improve Green Competence With Green Motivation As Intervening Variable (Suharyani & Nurhayat, 2023)	Green knowledge management positively influences green competency, with motivation as a mediating factor	Study focused on the mining sector in Indonesia, which may limit generalizability	Green knowledge management, green motivation, green competency	Enhancing managerial competence in green practices through knowledge management
13	Green Human Resource Management: Mapping the Research Trends for Sustainable and Agile Human Resources in SMEs (Papademetriou et al., 2023)	Green HRM is essential for building sustainable and agile HR in SMEs	Focus on SMEs may limit the applicability of findings to larger organisations	Green HRM, sustainable HR practices	Enhancing HR sustainability and agility, promoting green practices in SMEs
14	The importance of green competences in advancing organisational sustainability: The empirical perspective (Gadomska-Lila et al., 2023)	Green competences play a crucial role in advancing organisational sustainability	Empirical study focused on specific regions, may not be universally applicable	Green competences, organisational sustainability	Promoting organisational sustainability through the development of green competences
15	The Innovative Human Resource Management Framework: Impact of Green Competences on Organisational Performance (Mirčetić et al., 2022)	Green competences significantly improve organisational performance within innovative HR frameworks	Study focused on specific sectors, which may limit generalizability	Green competences, organisational performance, innovative HRM	Improving performance through the integration of green competences in HR practices
16	The Role of Managerial Skills in the Sustainable Development of SMEs in Mehedinti County, Romania (Popescu et al., 2020)	Managerial skills are critical for the sustainable development of SMEs	Focus on a specific geographic area (Mehedinti County, Romania), which may limit generalizability	Managerial skills, sustainable development, SMEs	Supporting sustainable development through enhanced managerial skills in SMEs
17	Change starts within: does managerial ability matter to green innovation? (Jiang et al., 2024)	Managerial ability plays a crucial role in fostering green innovation within organisations	Focus on specific industries, which may limit generalizability	Managerial ability, green innovation	Promoting green innovation by improving managerial skills

No.	Study	Focus	Research Limitations	Types of Competences Studied	Main Antecedents for Developing Green Managerial Competences
18	How Corporate Social Responsibility Engagement Strategy Moderates the CSR-Financial Performance Relationship (Tang et al., 2012)	Aligning CSR with corporate strategy enhances financial performance and brand reputation	Focus on large multinational companies, may not be applicable to SMEs	CSR, financial performance, corporate strategy	Enhancing brand reputation and financial stability through strategic CSR engagement
19	Achieving sustainability through attention to human resource factors in environmental management (Daily & Huang, 2001)	Engaging employees in environmental practices improves job satisfaction and organisational commitment	Limited to manufacturing sectors, may not apply to service industries	HR factors, environmental management, sustainability	Enhancing job satisfaction and organisational commitment through environmental engagement
20	Green human resource management: A review and research agenda (Renwick et al., 2013)	Green HRM can drive competitive advantage through innovation and proactive regulatory compliance	Review-based study, lacking empirical data	Green HRM, competitive advantage, innovation	Gaining competitive advantage through innovation and proactive compliance with future regulations

The Table 1 provides a comprehensive overview of the antecedents driving the development of green managerial competences within organisations, highlighting the growing importance of sustainability in corporate strategies. One of the primary drivers for companies is the need to minimise their negative environmental impact and ensure compliance with legal regulations. Dalla Valle et al. (2024) emphasise that GHRM plays a crucial role in supporting strategic sustainability goals, which are essential for long-term operational efficiency. Similarly, Cabral and Dhar (2019) note that the development of professional competences that promote eco-friendly activities contributes to raising environmental awareness within organisations, which is vital for adapting to changing market and regulatory conditions.

In addition to regulatory compliance, organisations are motivated by the desire to gain a competitive edge through innovation and proactive management. Mehrajunnisa et al. (2022) indicate that GHRM practices can significantly improve business outcomes, thereby enhancing a company's competitiveness in the market. The implementation of innovative solutions, such as green supply chain management (Shariff, 2017), is driven not only by the need to comply with legal requirements but also by the goal of meeting stakeholders' expectations and building the company's reputation as a leader in sustainability. Tang et al. (2012) highlight that a strategic approach to corporate social responsibility (CSR) engagement can yield financial benefits and strengthen brand reputation, which is crucial for the long-term financial stability of the company.

Employee engagement and job satisfaction are also key drivers for developing green competencies. Daily and Huang (2001) emphasise that involving employees in environmental practices contributes to improved job satisfaction and organisational commitment, which, in turn, enhances overall organisational performance. In the context of small and medium-sized enterprises (SMEs), Popescu et al. (2020) note that developing managerial skills that support sustainable development is crucial for the long-term success of these firms. The ability to engage employees in sustainability efforts not only helps in achieving environmental goals but also fosters an organisational culture of continuous improvement and innovation within the organisation.

Another significant driver for developing green managerial competences is the need to foster green innovation. Jiang et al. (2024) point out the critical role of managerial ability in promoting green innovation within organisations, which benefits both the environment and the organisation's long-term development. This perspective aligns with the view that green competences are not only about compliance and operational efficiency but also about positioning the organisation as an innovator in sustainability. Renwick et al. (2013) further support this by suggesting that GHRM can drive competitive advantage through innovation and proactive compliance with future regulations.

The review of the literature on green competences highlights the multifaceted antecedences driving their development within organisations, ranging from regulatory compliance and operational efficiency to innovation and competitive advantage. The integration of green competences into man-

agerial practices is not merely a response to external pressures but also a strategic initiative to foster long-term sustainability, enhance employee engagement, and drive innovation. As businesses navigate the complexities of a rapidly changing global environment, these competences emerge as critical for ensuring resilience and sustainable development.

Looking ahead, the emphasis on green competences highlights a broader trend toward cultivating future-oriented skills essential for meeting the evolving challenges of the 21st century, as emphasised in global and EU reports (United Nations, 2015; European Commission, 2019). With environmental concerns increasingly central to the global agenda, the ability to innovate, adapt, and lead in sustainability is becoming more crucial than ever. Organisations must prioritise the development of these capabilities to remain competitive and contribute meaningfully to global sustainability efforts.

Materials and research methods

The results presented in the article are based on empirical data collected through a survey conducted during a conference organised by the Voivodeship Labor Office in Katowice on May 16, 2024. The conference, entitled "Qualifications for a Just Transition of the Region: 20 Years of Poland in the EU", was targeted at entrepreneurs living or working in the central subregion of the Silesian Voivodeship. This area includes mining subregions eligible for support from the Just Transition Fund – namely, Bytom, Gliwice, Katowice, Sosnowiec, and Tychy. Attendees had previously expressed interest in participating in training services aimed at developing competencies necessary for employment in the green economy sector.

The event was relatively small in scale, with approximately 200 participants, including both entrepreneurs and directors of District Labor Offices operating in the Silesian region. The survey tool consisted of a 10-question, close-ended questionnaire designed to identify key green managerial competences, define the profile of a sustainable development-oriented manager, and assess the need for further development and reinforcement of these competences.

The questionnaire was distributed to all conference participants. A total of 103 completed questionnaires were returned, of which 71 were verified as correctly and fully completed and thus qualified for further analysis. The final sample included 53 entrepreneurs and 18 CEOs of District Labor Offices.

In terms of demographics, most respondents were aged between 31 and 60 and held higher education degrees. The majority were men occupying senior positions such as: (1) company owner, (2) director or deputy director, (3) management-level position, or (4) specialist/senior specialist or an (5) independent role. Due to the relatively small and close-knit nature of the event, many entrepreneurs were reluctant to disclose the specific industries in which they operate, expressing concern that such information could potentially reveal their identity. As a result, detailed sectoral data were not included in the analysis to preserve participant anonymity.

Although specific industry data were not collected due to confidentiality concerns, it is important to note that the conference was primarily dedicated to entrepreneurs operating in sectors particularly relevant to the green transition. These include industries undergoing significant transformation or offering potential for sustainable development, such as renewable energy, mining and post-mining restructuring, construction (especially energy-efficient and passive building), waste management and recycling, transport and electromobility, green technologies (GreenTech/CleanTech), environmental consulting, and professional training services related to sustainability and green innovation.

This preliminary study is part of the international project "Sustainable Alliance Manager: Learning Experience towards Collaborative Skills with Green Consciousness" (SAMExperience), running from 2023 to 2026, with partners from Spain, Romania, Lithuania, Italy, and Poland, including the authors of this article. The project aims to advance knowledge on green awareness and competences among SME entrepreneurs.

The survey also included questions to identify the main determinants of acquiring and developing green managerial competences, forming the basis for the analysis presented in this article. The survey results are highly significant, providing valuable insights into the current needs and challenges related to developing green management competencies in the context of sustainable develop-

ment. Developing these competences is essential for the effective management of organisations in response to increasing environmental and corporate social responsibility demands.

Although the structured nature of the questionnaire and the limited number of participants resulted in a high degree of data consistency, this study has some limitations. Firstly, due to purposive sampling and the small sample size, the results cannot be generalised to the entire population (though it should be noted that there are 31 District Labour Offices in the Silesian Region). Additionally, the survey was conducted within the specific context of the conference, which may have influenced respondents' answers. Despite these limitations, this study makes a significant contribution to understanding the determinants and needs for developing green management competences and highlights the need for further, more detailed research in this area. The authors plan to conduct a follow-up survey as part of the next phase of the SAMExperience project, which will allow for more in-depth analysis and verification of the findings in a broader geographical and sectoral context.

To accurately understand the respondents' opinions and their approach to developing green managerial competences, it was necessary to employ appropriate analytical tools. For this purpose, a multivariate statistical method, specifically Principal Component Analysis (PCA), was utilised. This method facilitated the achievement of one of the study's objectives: identifying the main factors motivating respondents to acquire and develop green competences.

The PCA method is widely known and extensively described in both Polish and international literature. A detailed description can be found in works such as (Kim & Mueller, 1978a, 1978b; Sztemberg-Lewandowska & Zacny, 2004; Sztemberg-Lewandowska, 2009). This article is of an applicative nature, so the idea of the PCA method is only outlined here without a detailed discussion of the methodology required to describe each step of this analysis. However, it is worth mentioning that the most popular criterion, based on eigenvalues, was used to determine the number of factors. This choice was also supported by the fact that such a number of extracted factors explained a significant percentage of the variance of the original variables, indicating that only a small portion of the information contained in these variables was lost. Rotation of the obtained factors was also necessary. The best results and the most clear interpretations of these factors were provided by the orthogonal Quartimax rotation. Factor analysis was performed using SPSS software.

Results and discussion

Green managerial competences are increasingly perceived by CEOs as a key element of organisational sustainability. However, there is still a lack of comprehensive research that fully identifies the awareness and understanding of the concept among both managers and executives. Existing analyses tend to focus primarily on general trends related to the skills gap and the demand for green competences, rather than on a detailed assessment of managerial awareness in the context of green transformation. For example, research conducted in the UK financial services sector revealed that managers often lack sufficient knowledge of sustainable practices, which significantly slows down the implementation of green initiatives in this sector (PwC, 2023). Similar conclusions can be drawn from Adecco Group's training programs, which showed that managers in the automotive and climate technology industries have limited knowledge of emissions management and sustainable resource management. In response to these deficits, Adecco launched training programs aimed not only at developing technical skills but also at raising awareness of the environmental impact of business decisions (Adecco Group, 2022). Similarly, Vantedge Search's analysis demonstrated that business leaders lack sufficient competences to effectively integrate sustainable practices into daily operations, particularly in the areas of emissions management and green innovation, necessitating intensified recruitment and training efforts (VantEdgeSearch, 2024). Despite reports such as LinkedIn's Global Green Skills Report (LinkedIn, 2022), detailed data on managerial knowledge remains incomplete. Research by Graczyk-Kucharska (2022) highlights the uneven awareness of green competences and underscores the need for further harmonisation of knowledge and practices across various industries to effectively meet sustainability challenges.

Aware of the existing research gaps, the authors decided to investigate the respondents' self-assessed knowledge about "green managerial competences" in their survey. Respondents were asked not only to assess their familiarity with the concept but also to indicate which of the competences

listed in the survey they considered to be green. As expected, only 8.5% of respondents clearly confirmed their familiarity with the concept and felt confident in identifying the appropriate competences. The majority (57.7%) acknowledged that they had heard of green competences but were unable to accurately identify them. Meanwhile, 32.4% of respondents had never encountered the term before and felt they were unable to identify these competences. Interestingly, in a subsequent question, where respondents were asked to identify green competences from a set of 35 different managerial skills, between 70.4% and 97.2% correctly recognised 11 "hidden" green competences. These competences were skillfully integrated by the authors into a set that included other categories of competences, such as social, cognitive, or technical, selected based on previous literature studies (Łapińska, Sudolska & Zinecker, 2022; Konfederacja Lewiatan, 2022; European Commission, 2022).

A detailed distribution of the respondents' answers identifying green competences is provided in Table 2.

Table 2. Distributions of respondents' answers identifying the managerial competences listed in the survey as green

Competences	Please indicate whether the given competence in your opinion is green (percentage of responses)				
	Definitely yes	Rather yes	Hard to say	Rather no	Definitely no
Ability to act in a situation of uncertainty	22.5	47.9	22.5	7.0	0
Critical thinking	53.5	35.2	1.4	9.9	0
Systems thinking	36.6	50.7	12.7	0	0
Social and ecological awareness	54.9	28.2	16.7	0	0
Creativity and innovation	54.9	32.4	8.5	4.2	0
Ethical conduct	54.9	32.4	5.6	7.0	0
Ability to act with respect for the environment and represent the values of sustainable development	81.7	16.9	1.4	0	0
Ability to innovate, identify opportunities and create new strategies to respond to green challenges	84.5	12.7	2.8	0	0
Global thinking	56.3	29.6	14.1	0	0
Accepting diversity	46.5	32.4	14.1	7.0	0
Resilience – the ability to adapt to changing conditions	46.5	47.9	5.6	0	0

* For the sake of clarity, only green competences are presented in the table.

A key observation from the study's results is that respondents demonstrated a strong ability to identify not only the more obvious green managerial competences, which are clearly associated with environmental awareness even without a deep understanding of the term – such as "Ability to innovate, identify opportunities, and create new strategies to respond to green challenges" or "Social and ecological awareness" – but also showed surprising accuracy in recognising less obvious competences. These competences, at first glance, may not necessarily be associated with sustainability or ecology, such as "Critical thinking" (88.7% agreement with "definitely yes" or "yes"), "Systems thinking" (87.3%), and "Creativity and innovation" (87.3%). The correct identification of green managerial competences by respondents, even those who had previously indicated a lack of familiarity with the term, may be surprising. However, this might reflect either the respondents' good intuition and general environmental awareness or the specific conditions under which the study was conducted, as discussed in the preceding chapter. The authors are also aware that the list of green competences presented in the study is not exhaustive. Given the research limitations and the ongoing lack of a definitive conceptualisation of green managerial competences in the literature, which does not yet provide a standardised set of components for this concept, the authors chose to focus on a select few

competences broadly classified as green based on a review of existing literature and analyses conducted as part of the Sam Experience project.

The main objective of the survey was to identify the dominant factors that motivate managers and executives to develop green competencies. To this end, respondents were asked which of the competences on the list they would like to improve in the near future. They were presented with the same list as in the competency identification question. The results clearly indicate a strong desire to develop green managerial competences in the future. More than half of the respondents expressed an interest in developing all of the green managerial competences listed in Table 2. The competences with the highest number of mentions, over 80%, were: the ability to act under uncertainty, resilience to change, creativity and innovation, and the ability to act with respect for the environment and promote the values of sustainability. While the popularity and desire to develop green managerial competences is understandable, given the desire of organisations to integrate business strategies with sustainability goals, research shows that the number of employees trained in green competences is growing more slowly than the demand for these competences, leading to a significant skills gap (LinkedIn, 2022). The same research and reports (Adecco Group, 2022) indicate that the proportion of employees with green competences increased globally from 9.6% in 2015 to 13.3% in 2021, a rise of 38.5%. Organisations are therefore focusing on developing competences related to environmental awareness, leadership in sustainability initiatives, and technical expertise in natural resource management. Key competences include the ability to assess environmental impacts, promote sustainability practices, and influence organisational culture towards greener operations (Sulich & Kozar, 2024; Ali et al., 2023).

Another issue examined by the authors of the study was the determinants that drive respondents to acquire and develop green managerial competences. A review of the literature and an observation of corporate practices, particularly in large companies, reveal that the development of green managerial competences in organisations is influenced by a broad range of factors. These include sustainability as a strategic goal, the pursuit of competitive advantage, the integration of green practices into corporate culture, and the implementation of advanced GHRM practices. Empirical research indicates that green strategic leadership capabilities (GSLC) are crucial for anticipating environmental changes, adapting to new conditions, and absorbing ecological knowledge, which enables organisations to minimise negative environmental impacts (Fan & Chung, 2023). Green transformational leadership (GTL) and GHRM are particularly significant in enhancing the environmental performance of organisations, especially within the SME sector, thereby supporting sustainable development (Awan et al., 2023; Hameed et al., 2021). Transformational leadership plays a pivotal role in fostering a green organisational culture, which, in turn, increases employee commitment to sustainability (Liu & Yu, 2023). Green organisational values, bolstered by transformational leadership, aid in the development of a green identity and the promotion of green initiatives (Gadomska-Lila et al., 2023). GHRM practices, such as green recruitment and training, are essential for promoting green managerial competencies within organisations. Research suggests that GHRM not only influences the development of strategic competences that improve environmental performance (Dalla Valle et al., 2024) but also enhances overall business performance through green employee behaviour (Mehrajunnisa et al., 2022).

The collaboration between green transformational leadership, green organisational culture, and GHRM practices positively influences an organisation's ability to achieve sustainable environmental goals (Rizvi & Garg, 2020). Furthermore, companies that develop green managerial competences gain a competitive advantage by being able to innovate both technologically and economically in response to rapidly changing market conditions and regulatory requirements (Shariff, 2017). The growth of green competences also supports green entrepreneurship, underscoring the strategic role of GHRM in building the long-term success of organisations (Yadav et al., 2023).

To better understand respondents' opinions on developing green competences, the authors of the study contrasted the survey results with existing literature on the determinants that support the development of these competences. The survey aimed to assess whether the motivations reported by respondents aligned with those previously identified in the literature, and it also allowed for a deeper analysis by reducing and grouping the antecedent factors, which facilitated the discovery of hidden drivers that may be crucial from the perspective of respondents' attitudes.

Given the respondents' interest in developing green managerial competences, it was important to understand what motivates them to acquire these competences. One of the survey questions specifically addressed this issue, asking participants to rate the extent to which each of the 12 determinants (listed in the second column of Table 3) influenced their willingness to develop green managerial competences. Due to the large number of drivers indicated, the authors conducted further analysis to reduce and group these drivers, as well as to identify latent factors that were not directly investigated but might play a key role in shaping respondents' attitudes. These objectives aligned with the methodology of PCA, which was applied in a subsequent stage of the study. This analysis was methodologically appropriate given the extended measurement scale (0-100%) used in the questionnaire. Through PCA, the authors were able to extract five new characteristic factors (Table 3) that together explain 83.7% of the variation in the original variables. These five components can be interpreted as latent but significant factors motivating managers to develop green managerial competences.

Table 3. Results of factor analysis – factor loadings matrix

No	Drivers	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
		Organisation	Competition	Self-develop-ment	Socio-eco-nomic changes	Job loss
1	Willingness to exert greater influence on the internal activities of the organisation and/or to participate in its impact on the external environment	0.886	0.192	0.122	0.082	-0.154
	Improving the image	0.846	-0.041	-0.145	-0.090	-0.283
	The need to contribute to the development of the organisation and the achievement of its goals	0.843	0.106	0.104	0.044	0.264
	A fuller understanding of the needs of employees and other stakeholders in the organisation	0.830	0.108	0.035	-0.054	0.267
2	Need to compete with other employees	0.098	0.897	0.142	-0.052	0.071
	Employer/direct supervisor requirements	0.312	0.762	-0.189	0.029	-0.289
	The need for development on the way to achieving professional promotion	-0.031	0.739	0.580	-0.032	0.016
	Situation on the labour market (competition)	0.063	0.702	-0.015	0.589	0.113
3	Inner need for personal development	0.153	0.156	0.910	0.047	0.010
4	The changing social and economic situation in Poland	0.008	0.049	0.050	0.939	-0.120
5	Fear of losing one's job	0.035	-0.051	-0.020	-0.103	0.926
	Changing trends and developments in management theory (need to update knowledge and keep up to date)	0.512	-0.171	0.437	0.401	-0.308

Table 3 presents the results of the principal component analysis, including factor loadings, which measure the correlation between the original variable (representing the observed drivers) and the created component (factor). The higher the absolute value of the factor loading, the greater the influence of the given variable on the created component. Factor loadings with high absolute values, highlighted in bold in Table 3, indicate variables that have the most significant contribution to the interpretation of a given component. The PCA analysis carried out revealed the following factors to be the most important among the antecedents of green managerial competences:
• Organisation,
• Competition,
• Self-development,
• Socio-economic changes,
• Job loss.

It is worth noting that the last three factors are based on single original variables, which do not form complex components but function as distinct motivations. These factors have a unique character, making them difficult to connect with other aspects or drivers studied in the survey. As a result, these factors operate as independent variables, as their specificity does not allow them to be easily combined with other factors into more complex components. Additionally, in Table 3, the factor loadings that may complicate the interpretation of results are marked in red. The greatest challenge was the clear assignment of the driver related to management trends, which was ultimately excluded from the analysis. Also problematic were the drivers concerning the necessity of development in the context of career advancement and the situation in the labour market. For this reason, the factors used in the further stages of the study were created by averaging the values of the variables that were most strongly correlated with them, as highlighted in bold in Table 3.

The survey results from the Silesia Region, as presented in Table 3, align with the findings of other researchers (Ali et al., 2024; Hussain et al., 2023; Maheshwari et al., 2024; Hasan, 2022; Al Doghan et al., 2022; Dalla Valle et al., 2024; Vasilev et al., 2024; Ashraf et al., 2024; Kalei, 2024).

The literature indicates that organisations that integrate green practices into their corporate culture and implement advanced GHRM practices can significantly enhance both their environmental and economic performance. For instance, studies show that GHRM, encompassing green recruitment, training, and development, not only supports sustainability but also fosters increased innovation and competitiveness in international markets.

Socio-economic changes associated with the economic transformation towards a green economy are crucial for the development of green managerial competences. The emergence of new sectors and industries, where green managerial competences are becoming essential, drives the need for both employees and organisations to adapt to evolving market demands. Research emphasises that the growth of green jobs and the creation of new, modern occupations – often referred to as the occupations of the future – are vital for keeping pace with global trends and setting new standards in international markets.

Finally, competition emerges as a crucial factor, as the current gap between workers with green competences and the growing market demand for such competences can be rapidly filled by highly qualified professionals. These individuals could become a social elite, further highlighting the importance of developing these competences in the face of impending economic and environmental challenges.

The survey results indicate that respondents' opinions align with global trends and the scientific literature on green managerial competences, sustainability, and GHRM. In particular, the drivers stemming from the economic transformation in the Silesia Region represent not only a challenge but also an opportunity to develop innovative and sustainable management practices that can contribute to the long-term success of organisations.

The next step in analysing the survey results was to determine whether one of the five main factors influencing respondents to acquire green managerial competences dominates over the others. To explore this research question, box plots were employed, utilising data from respondents who expressed an interest in developing the specified competences.

This means that for each of the 11 analysed green competences, only the responses of individuals who answered "definitely yes" or "probably yes" to the question about future interest in a given competence were considered. Based on this, the distributions of the previously created factors were examined for the identified subgroups of respondents and presented in box plots (Fig. 1 (a) – (k)). In the plots, the line inside the box indicates the mean value, and the box itself represents deviations from the mean by the value of the standard error ($\bar{x} \pm stand.error$). The whiskers of the plots illustrate the range of variability, meaning values within two standard deviations from the mean ($\bar{x} \pm 2s$). All observations that the algorithm identified as outliers or unusual were marked on the plots with circles and asterisks.

Analysing the obtained results and comparing the distributions of factors, it can be concluded that for all the studied green managerial competences, the highest average values are associated with drivers related to the fear of job loss and socio-economic changes. These changes are closely tied to the economic transformation toward a green economy and the necessity to adapt to new market realities, including the creation of future professions linked to the green market. The fear of job loss is also becoming a key driver, particularly in the context of shrinking timeframes for retraining and

upskilling. As highlighted in a World Economic Forum report, up to 50% of workers will need to retrain within the next five years, and 40% of green skills are expected to change (World Economic Forum, 2020). In this context, developing green managerial competences becomes not only a response to an immediate threat but also an adaptation to the changing needs of the labour market, which increasingly emphasises skills related to managing in a green environment.
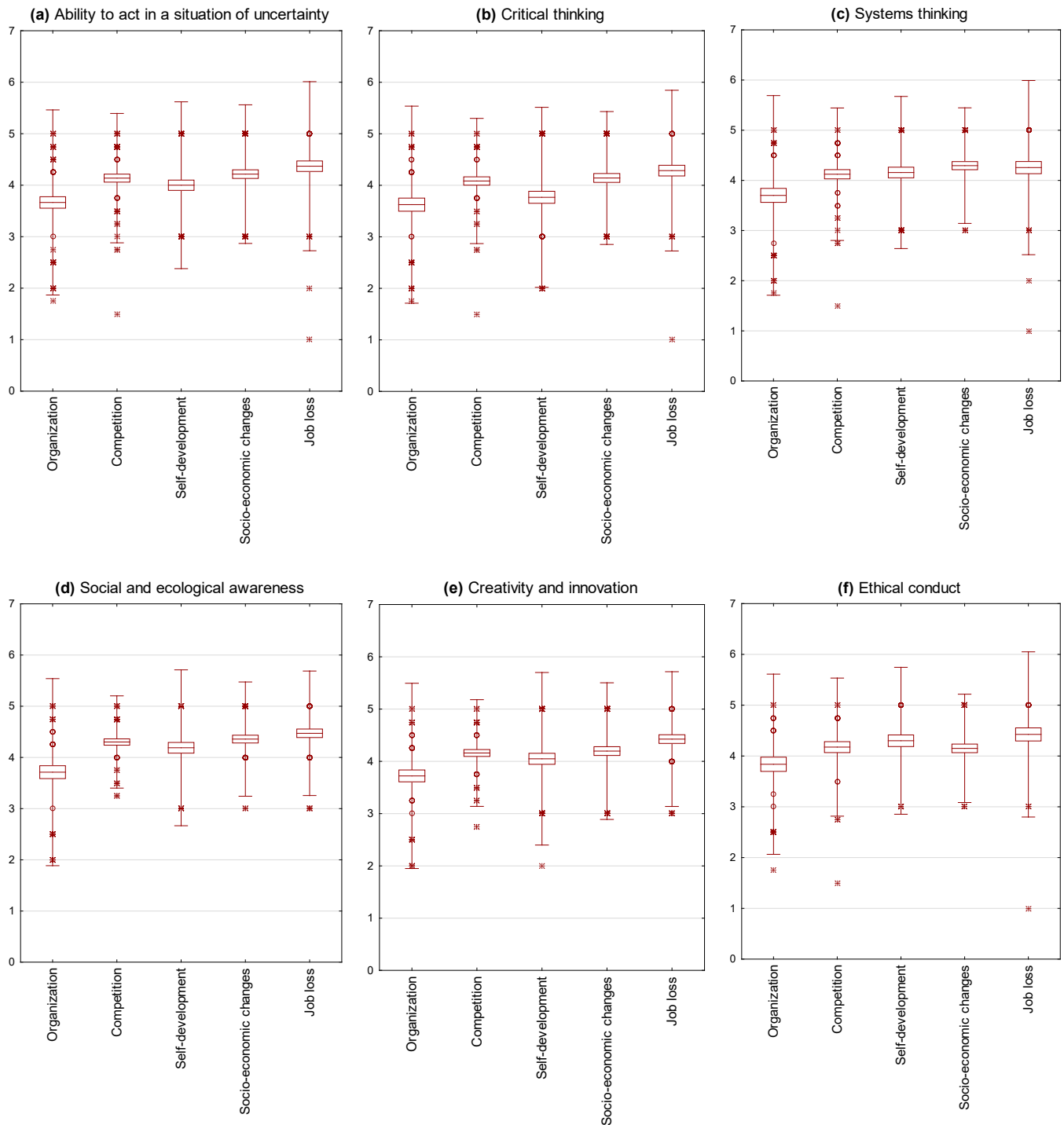
Figure 1. Box plots showing the distributions of factors calculated on the basis of information obtained from respondents who declared (definitely or potentially) an interest in developing particular green competences (from (a) to (k))
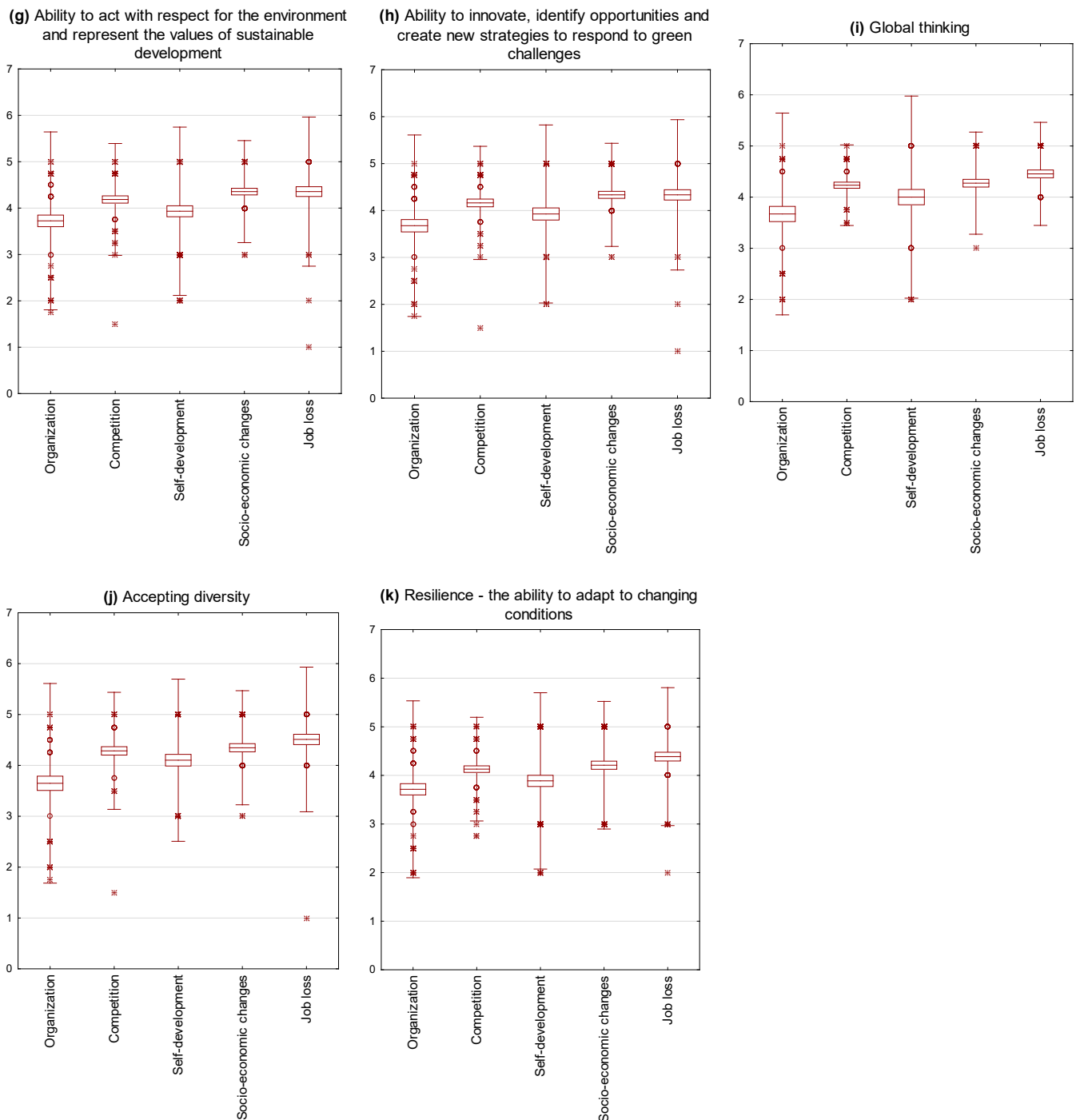
Figure 1. Box plots showing the distributions of factors calculated on the basis of information obtained from respondents who declared (definitely or potentially) an interest in developing particular green competences (from (a) to (k))

However, it is worth noting that the differences in the mean values of the developed factors are not large, indicating that other drivers are also significant. Although they may have less impact, they still play an important role by indirectly supporting the dominant factors. Specifically, in the case of competences such as the ability to act with respect for the environment and innovation in identifying new strategies, the mean values for the two dominant factors were very close, suggesting a synergistic effect.

These observations confirm widely visible trends in organisational management and human resource development, especially in the context of the learning and intelligent organisation, which

are increasingly relevant in a changing economy. Employers, striving to be leaders of change, are following market trends and the expectations of customers, who are showing a growing environmental awareness and expect to implement ESG principles. At the same time, employers are creating organisations where employees can identify the company's vision and mission with their values, which increases their motivation to develop green managerial competences.

The PCA analysis thus confirms the consistency in the approach to the antecedents related to the development of green managerial competences, indicating a deep integration of these factors into modern management and sustainability practices within organisations.

Conclusions, limitations and further research

In the face of dynamic socio-economic changes, many employees, including managers, recognise the necessity of developing green competencies. These competences encompass not only skills related to emerging industries, such as green energy, but also the soft skills essential for effectively managing a green organisation and expanding knowledge about sustainable development. Particularly valued are competences such as critical thinking, which enables the assessment and adaptation to new challenges, and resilience, the ability to flexibly adjust to changing conditions. These competences are becoming crucial in environments where organisations must continually respond to changes, not only in the context of environmental protection but also in response to evolving legal regulations and societal expectations. As a result, developing these competence skills is seen as a necessary step in preparing both employees and organisations to function effectively in the green economy of the future.

The authors, presenting the results of the conducted research, aimed to fill a significant research gap concerning the identification of factors that motivate managers to develop and acquire green managerial competences. To achieve this, they conducted a study designed to address existing knowledge gaps and provide new insights on the topic. The main objectives of the study included: 1) exploring the extent to which respondents are familiar with the concept of green managerial competences and examining their ability to accurately identify specific competences associated with this concept, 2) identifying the main determinants that motivate managers and organisational leaders to acquire and develop green managerial competences, which are essential for the effective implementation of sustainable practices within organisations, and 3) assessing whether managers and organisational leaders express interest in acquiring and developing green competences in the future. The accomplishment of these objectives was intended to provide valuable information that could help better understand the factors motivating managers and contribute to the development of more effective educational and motivational strategies that support the growth of green managerial competences within organisations.

In response to the first research question – To what extent are respondents familiar with the concept of green managerial competences, and how accurately can they identify specific competences associated with this concept? – the study found that although only 8.5% of respondents declared a clear familiarity with the concept and felt confident in identifying relevant competences, a significantly larger proportion demonstrated an intuitive understanding of these competences. While 57.7% had heard of green managerial competences but could not accurately define or identify them, and 32.4% had never encountered the term, most respondents were able to correctly recognise specific green competences when presented in a mixed list of managerial skills. Between 70.4% and 97.2% of respondents accurately identified both obvious and less apparent green competences, such as systems thinking, critical thinking, and creativity. This suggests that while declarative knowledge is limited, there is a high level of intuitive recognition of sustainability-related skills among practitioners.

Addressing the second research question – What are the main determinants that motivate managers and organisational leaders to acquire and develop green managerial competences? – the results of the principal component analysis (PCA) revealed five key motivating factors: organisational context, market competition, personal self-development, socio-economic changes, and fear of job loss. Among these, socio-economic transformation and fear of job loss emerged as the most influential drivers. These findings align with global research emphasising the role of green human resource

management (GHRM), green leadership, and organisational values in shaping the demand for green competences. Managers are motivated not only by internal organisational strategies but also by the pressures of external change – including emerging green industries, evolving labour market expectations, and the increasing demand for environmental accountability.

Finally, in relation to the third research question – Are managers and organisational leaders interested in acquiring and developing green competences in the future? – the study clearly indicates a strong and widespread interest. More than half of the respondents expressed a willingness to develop each of the green managerial competences presented in the survey. The competences most frequently selected for future development (over 80% of responses) included the ability to act under uncertainty, resilience to change, creativity and innovation, and respect for the environment, combined with the promotion of sustainability values. This suggests that green managerial competences are not only recognised but also seen as strategically valuable for future organisational success and personal career development.

In summary, although conceptual familiarity with green managerial competences remains limited, practitioners demonstrate strong intuitive understanding and express high interest in their future development. The factors driving this interest reflect both internal motivations and external socio-economic pressures, underscoring the relevance of these competences in the context of sustainable transformation at both the organisational and regional levels.

However, in the study examining green managerial competences, several notable limitations affect the generalizability and depth of the findings. First, the research relies solely on survey methodology, which inherently limits the depth of insight into the topic. The use of a survey, while useful for gathering a broad spectrum of opinions, restricts the exploration of more complex or nuanced aspects of green managerial skills. Additionally, the sample size was relatively small, with only 71 participants, which may not provide a representative view of the larger population. This small sample size increases the risk of biased or non-generalizable results, as it might not capture the full range of perspectives on green competences in management. Another significant limitation is the geographical restriction of the study, which was conducted only in the Silesian Region. This localisation means that the findings may not be applicable to other regions with different economic, environmental, or cultural conditions. Furthermore, the study focused on specific groups: District Labour CEOs and representatives of some companies from the Silesian region. This narrow focus could limit the applicability of the findings to other sectors or regions where different organisational structures and managerial competencies may be present. Finally, the study was limited to collecting participant opinions, which introduces potential cognitive biases and subjective interpretations. These opinion-based responses may not fully reflect the actual competences or practices in the workplace, creating further limitations in drawing definitive conclusions about green managerial competences in a broader context.

In future research, it would be beneficial to extend the analysis to other regions of Poland and other countries to compare the determinants and needs associated with developing green managerial competences. The authors plan to continue and geographically expand the research within the SAMExperience project, which will enable more representative results. Additionally, in-depth interviews with managers are planned, which will provide valuable insights into the practical application of green competences across different industries. This approach may uncover specific differences in conditions and training needs across various economic sectors, such as energy, automotive, or financial services.

The findings of the study have significant implications for both theory and practice. From a theoretical perspective, the study contributes to further conceptualising the notion of green managerial competences, emphasising the importance of soft skills and adaptability to change as key elements of management in the green economy. The study also enhances understanding of how different factors influence the development of these competences, potentially serving as a foundation for more precise definitions and theoretical frameworks in future research. From a practical standpoint, organisations should invest in training programs that develop both technical and soft green competences to meet increasing market demands and societal expectations. Effective change management and employee development are, therefore, key components in the strategy of organisations striving for long-term sustainability success.

The contribution of the authors

Conceptualisation, S.S., A.F.-W. and J.T.; literature review, S.S. and A.F.-W.; methodology, S.S., A.F.-W., J.T. and D.Ł.; formal analysis, S.S., A.F.-W., J.T. and N.M.-L.; writing, S.S. and A.F.-W.; discussion, S.S., A.F.-W. and J.T.; conclusion, S.S., A.F.-W., D.Ł. and N.M.-L.

The authors have read and agreed to the published version of the manuscript.

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UWARUNKOWANIA NABYWANIA I ROZWIJANIA ZIELONYCH KOMPETENCJI MENEDŻERSKICH – PERSPEKTYWA PRZEDSIĘBIORCÓW I DYREKTORÓW POWIATOWYCH URZĘDÓW PRACY

STRESZCZENIE: Cel: Rosnące naciski ekologiczne, społeczne i regulacyjne sprawiają, że nabywanie zielonych kompetencji menedżerskich staje się kluczowe dla budowania przewagi konkurencyjnej. Celem badania było zidentyfikowanie głównych uwarunkowań wpływających na ich nabywanie i rozwój, ocena zainteresowania menedżerów tymi kompetencjami oraz analiza opinii i poziomu wiedzy dyrektorów Powiatowych Urzędów Pracy oraz przedsiębiorców z regionu śląskiego. Metodologia: Zastosowano analizę składowych głównych (PCA) do analizy danych pochodzących z 71 wywiadów strukturyzowanych przeprowadzonych w maju 2024 roku z dyrektorami Powiatowych Urzędów Pracy oraz przedsiębiorcami z regionu śląskiego. Wyniki: Wyniki badania przyczyniają się do konceptualizacji zielonych kompetencji menedżerskich, stanowiąc podstawę do precyzyjniejszych definicji w przyszłych badaniach. Respondenci szeroko definiują te kompetencje, uwzględniając zarówno umiejętności związane z zieloną gospodarką, jak i kompetencje osobiste, społeczne i interpersonalne. Zidentyfikowano pięć kluczowych uwarunkowań: organizacja, konkurencja, samorozwój, zmiany społeczno-gospodarcze oraz utrata pracy, które istotnie wpływają na osiąganie przewagi konkurencyjnej organizacji, szczególnie w kontekście transformacji gospodarki w kierunku zrównoważonego rozwoju. Praktyczne i społeczne implikacje: Wnioski z badania dostarczają wskazówek dla menedżerów w zakresie rozwijania kompetencji niezbędnych do skutecznego przejścia na gospodarkę zrównoważoną. Podkreślanie zielonych kompetencji wspiera rozwój zrównoważony i dostosowuje strategie organizacyjne do celów społecznych. Oryginalność: Badanie wypełnia lukę badawczą, pogłębiając zrozumienie zielonych kompetencji menedżerskich i identyfikując kluczowe czynniki wpływające na ich rozwój.

SŁOWA KLUCZOWE: województwo śląskie, zielona gospodarka, zielone kompetencje, zielone zarządzanie