The Pathway of Green Shift Research: Insight from Bibliometric Study on Sustainable Competence and Organizational Green Culture

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Abstract. This study aims to map the development of scientific literature on sustainable competence and green organizational culture as two fundamental pillars in shaping pro-environmental behavior within organizations. Using a bibliometric approach, the study analyzes 177 scientific articles published between 2015 and 2025, sourced from Scopus and Google Scholar databases. The analysis was conducted with the aid of VOSviewer software, generating network, overlay, and density visualizations to illustrate the conceptual interconnections among key themes. The findings reveal that while sustainability, green innovation, and green human resource management dominate the discourse, the integration between individual competence and organizational culture as drivers of ecological behavior has yet to become a central focus in academic studies. The visualizations indicate that keywords such as "sustainable competence" and "green organizational culture" remain peripheral in mainstream discussions. This suggests a significant research gap in bridging macro-structural and micro-behavioral approaches within the green organization context. The study contributes theoretically by offering an integrative approach to understanding human-centered sustainability dynamics and practically by guiding the development of organizational strategies that prioritize competency building and collective values. The implications underscore the need for strategic interventions in human resource training, cultural transformation, and policy formulation that embed sustainability as a core organizational element. Thus, this article expands the intellectual horizon of sustainability management and opens new pathways for future interdisciplinary research.

Keywords: _Green Shift, Sustainable Competence, Organizational Green Culture, Pro-Environment Behavior, Bibliometric Analysis._

INTRODUCTION

In recent decades, the global community has increasingly been confronted with the urgency of addressing the environmental crisis, climate change, and natural resource degradation. These issues have not only permeated public policies and international agreements, but have also changed the way organizations understand their roles and responsibilities towards sustainability. Environmentally friendly organizational practices, often referred to as the "green shift," have become increasingly important in modern corporate strategy. Organizations are now judged not only on their economic performance, but also on the extent to which they are able to integrate sustainability values and reduce their ecological footprint. Research shows that organizations with a green culture tend to encourage pro-environmental behavior among their employees, resulting in competitive advantage and improved workplace environmental quality (Brown et al., 2010; Pham et al., 2018; Wang et al., 2022; Abou-AL-Ross & Mahadi, 2021).

As the complexity of environmental challenges increases, the concepts of sustainable competency and green organizational culture are gaining more attention in the organizational management literature. Sustainable competency refers to the knowledge, skills, and attitudes of individuals required to make responsible decisions that have long-term impacts on the environment, economy, and society (Hadi et al., 2022; Chen, 2011; Palupiningtyas, 2024). Green organizational culture, on the other hand, reflects the values, norms, and practices that support positive environmental behavior within an organization. Both concepts are considered vital in driving the

transition to more sustainable organizational practices and increasing employee contributions to environmentally friendly actions (Tariq et al., 2014; Wang, 2019; (Shaikh et al., 2023) further research by Maulana et al., (2023) based on mediation analysis shows that Green Human Resource Management (GHRM) Practices through Green Innovation have a significant effect on Environmental Performance of Employees of the Regional Secretariat of the Pasuruan City Government.

There is an increasing body of publications addressing these two concepts, but the existing literature tends to be fragmented. Studies develop different theoretical frameworks, use inconsistent terminology, and employ diverse empirical approaches. Some studies focus on the role of green human resource management in shaping sustainability competencies, while others emphasize the psychological mechanisms that influence employees' pro-environmental behavior (Khazeal & Majeed, 2020; Desak et al., 2023; Darvishmotevali & Altınay, 2022). The lack of a comprehensive synthesis on the interplay between these two concepts in the context of pro-environmental behavior in organizations further underscores the importance of this research, especially considering that sustainability is a central part of the global agenda and the Sustainable Development Goals (SDGs) (Amusat et al., 2022; الشكور & النيل, 2022).

The bibliometric approach is the most appropriate method to address these challenges, allowing bibliographic data analysis to reveal key trends and themes in this study (Loeser et al., 2017; McBeath, 2016; Zhang et al., 2018). Although this method has been applied in environmental studies and sustainability education, there is a significant gap in the literature that specifically focuses on sustainability competencies and green organizational culture (Wang et al., 2022 & Soewarno et al., 2019).

The uniqueness of this study lies in its integrative approach that examines how the two concepts of sustainable competency and green organizational culture interact and influence organizational transformation towards more sustainable practices (Shaikh et al., 2023; Wang et al., 2022). This study also aims to provide a useful conceptual map for researchers, practitioners, and policy makers to support organizational transitions towards better sustainability.

Based on the analysis, this study will answer questions about the evolution of literature related to sustainable competence and green organizational culture, dominant themes that shape this field, and areas that still need further research on pro-environmental behavior. Through a bibliometric approach, it is hoped that this study can clarify important and urgent research directions to support the development of theory and practice in the context of sustainability.

LITERATURE REVIEW
1. Sustainable Competencies in an Organizational Context

Sustainability competencies have emerged as fundamental elements in shaping individual behavior and decisions in organizations committed to sustainability. These competencies encompass the knowledge, skills, attitudes, and values necessary for active engagement in practices and decision-making that simultaneously consider environmental, social, and economic dimensions. A sustainability competency framework developed by Eberz et al. (Eberz et al., 2023) includes systems thinking, anticipatory, normative, strategic, and interpersonal competencies that are critical to the development of each individual in a sustainable organization. In this context, these competencies not only serve as individual instruments, but also contribute to team performance and collective ability to manage risks and

opportunities related to environmental issues.

Research shows that sustainability competencies are positively correlated with ethical decision-making, engagement in green innovation, and increased environmental awareness in the workplace. For example, research by Nair and Bhattacharyya Nair & Bhattacharyya (2022) underlines the importance of understanding these competencies within the Green Human Resource Management (GHRM) framework. These competencies are often seen as the result of ongoing education processes, ongoing job training, and recruitment based on environmental values. However, criticism has emerged from Eberz et al. (Eberz et al., 2023), who point out that many organizational interventions are normative and have not been integrated with existing performance appraisal systems, so that the implementation of sustainability competencies is often only symbolic. Therefore, it is important to position these competencies as strategic elements in the development of more integral human resources and organizational culture.

2. Green Organizational Culture as a Foundation for Pro-Environmental Behavior

Green organizational culture is a key construct that explains how environmental values and norms are embedded and maintained within an organization. Referring to Schein's organizational culture theory, culture consists of artifacts, shared values, and underlying assumptions that shape collective behavior. In the context of sustainable organizations, this culture is reflected in policies and practices that support resource efficiency, ecological responsibility, and active participation in environmental conservation. Research by Harris and Crane shows that the creation of environmental values can build organizational identity, where green culture becomes the foundation for the company's strategic orientation towards sustainability issues.

Several studies have shown that green organizational culture plays a significant role in encouraging pro-environmental behavior from employees. Robertson and Barling found that organizations with a strong green culture have employees who are more environmentally conscious and more likely to demonstrate voluntary ecological behavior. A study by Norton et al. also confirmed that employees' perceptions of environmental support from the organization increase their likelihood of engaging in green organizational citizenship behavior. However, the top-down approach to green culture development often results in resistance among employees, leading to a phenomenon known as green fatigue.

Criticism of previous research suggests that many organizations adopt green culture symbolically, aiming to improve their reputation without having a real commitment to the environment. Therefore, the current study encourages the importance of employee engagement both emotionally and cognitively in shaping a more authentic green culture, which can be achieved through a participatory approach. This suggests that in order to achieve sustainable behavioral change, organizations need to understand the dynamics of cultural development that can create a social environment conducive to consistent pro-environmental behavior.

3. The Relationship between Sustainability Competence, Green Organizational Culture, and Pro-Environmental Behavior

The relationship between sustainability competency, green organizational culture, and pro-environmental behavior is an important

focus in understanding the contribution of individuals and organizations to ecological transformation. Theories such as the Theory of Planned Behavior and Value-Belief-Norm Theory offer explanations of the mechanisms of the relationship between these three variables, emphasizing the role of internal values and norms and perceived control in predicting pro-environmental actions. In an organizational context, high individual competency in sustainability can strengthen the belief to behave ecologically, while green organizational culture provides a social environment that supports the internalization of these values.

Research by Dumont et al. showed that effective GHRM can enhance individual environmental competence and directly influence pro-environmental behavior, with a mediating role of green organizational culture. Jabbour and de Sousa Jabbour emphasized the importance of integration between green human resource strategies and organizational culture in encouraging employee innovation and engagement in sustainable activities. Although these results offer valuable insights, methodological challenges still need to be addressed, such as the lack of a longitudinal approach to study long-term effects and limitations in measuring organizational culture and individual competence.

A critical review of the existing literature suggests that many existing theoretical models tend to be linear and do not fully capture the complexity of the interactions between individuals and organizational systems. More integrative and interdisciplinary research is needed, including bibliometric analysis to map the development of theories and methods in this field. This approach is essential to understanding the interplay of sustainable competencies, green organizational culture, and pro-

environmental behavior as part of a broader system in supporting sustainable organizational transformation in the future.

METHOD
Research Approach

This study uses a bibliometric approach as the main method to analyze the development of scientific literature related to the themes of green shift, sustainable competence, and green organizational culture over the past decade. The bibliometric approach was chosen because of its ability to map the structure of scientific knowledge systematically and visually, as well as identify trends, scientific collaborations, and conceptual dynamics in certain fields of study Gallagher et al. (2018). Bibliometric studies provide significant added value in the development of scientific disciplines because they are able to reveal publication patterns, author distribution, collaboration networks, and dominant concept maps in certain fields Mabon & Shih (2021). This approach is particularly relevant in the context of growing topics, such as sustainable competence and green organizational culture, which reflect managerial transformations towards more environmentally friendly practices. This study also uses bibliometrics as an interpretive tool to examine the relationship between concepts and theoretical constructs longitudinally, which is further strengthened by previous studies on the importance of these concepts in the sustainability literature Dzhengiz & Niesten (2019), D'Souza et al. (2019).

Data Sources and Types

The data in this study are in the form of scientific article documents obtained from two main databases, namely Scopus and Google Scholar. The selection of these two databases is based on their complementary characteristics. Scopus, as a highly reputable scientific database, provides assurance of the quality and

validity of publications, while Google Scholar has a broader and more inclusive scope, especially in capturing articles that are not indexed in commercial journals but still have academic influence Redman & Wiek (2021). The articles collected are publications published in the period 2015 to 2025, in order to capture the latest developments and current trends in relevant literature Cebrián et al. (2021). The type of data used is secondary and structured, including article metadata such as title, author name, affiliation, keywords, abstract, year of publication, and journal source. Overall, there were 177 articles that were successfully identified and further processed in this bibliometric analysis, emphasizing the importance of comprehensiveness in data collection for the development of research in this field Hassan (2021).

Data Collection Process

Data collection was carried out systematically using a combination of main keywords that reflect the focus of the study, namely "green shift", "sustainable competence", and "organizational green culture". The search process begins by compiling the appropriate search string according to the syntax of each database. For Scopus, the filters used include the year of publication, type of document (article and review), and language (English) Cebrián et al. (2020). For Google Scholar, the filter was done manually by considering the relevance and recurrence of the document. Each search result was selected based on its relevance to the main topic of the study, as well as the appropriateness of the bibliographic information needed for the further analysis process. The data obtained from each database was then exported in RIS, CSV, and BibTeX formats that are compatible with bibliometric software, facilitating efficiency in data processing Jelonek & Urbaniec (2019).

Data Selection Process

Data selection was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method to ensure transparency and accuracy in screening articles by Lozano et al. (2017). The PRISMA stage begins with the initial identification process that produced more than 300 documents, then continued with the screening process based on the suitability of the title and abstract. In addition, the eligibility step was carried out by reading the full content to ensure relevance to the main theme. Finally, the inclusion stage left 177 articles that met all selection criteria. The PRISMA methodology provides a systematic framework that helps researchers trace the reasons for inclusion and exclusion of articles in a logical and replicable manner, which is crucial to maintaining data integrity and validity of analysis in the bibliometric study of Ploum et al. (2017).

Data Interpretation Process

Data analysis and interpretation were performed using the bibliometric software VOSviewer, which is specifically designed to build and visualize bibliographic networks based on bibliometric information. With VOSviewer, data were analyzed through four main views, namely network visualization, overlay visualization, density visualization, and co-author collaboration. This approach is supported by literature that shows the effectiveness of VOSviewer in creating informative mapping for multidisciplinary research dynamics Salgado et al. (2017), Brundiers & Wiek (2017). Interpretation was carried out by examining the emergence of dominant keywords, the interconnectedness between concepts, and mapping research dynamics from year to year. The results of this visualization were then examined qualitatively to reveal the conceptual and methodological implications of the findings in the literature, making it a very valuable tool for understanding the structure of knowledge in sustainability studies Redman et al. (2020).

RESULTS AND DISCUSSION

1. Custer Analysis

Table 1
Cluster Analysis

Cluster 1	Cluster 2	Cluster 3
Green purchase intention	Green innovation	Green human resource management
Sustainable development	sustainability	Pro-environment behavior
Sustainable development green		

Source: Processed data (2025)

Table 1 shows the results of cluster analysis of 177 articles analyzed using VOSviewer. The results show three main clusters with dominant keywords: green purchase intention, green innovation, and green human resource management (GHRM) in cluster 1; sustainable development and sustainability in cluster 2; and pro-environment behavior and sustainable development green in cluster 3. This pattern indicates a clear thematic structure in the literature discussing the relationship between sustainable competencies and organizational culture (Uyanık, 2023; White et al., 2019).

The first cluster shows the focus on the organization's operational strategy through innovation and green human resource management. The existence of green innovation and GHRM in one cluster shows that the organization's approach to sustainability does not only depend on technology, but also on the ability of human resources to support the green agenda. This supports the Resource-Based View (RBV) theory which states that competitive advantage comes from internal resources, including employee competence in producing sustainable innovation (Uyanık, 2023; Seriki, 2020; Peteraf, 1993). Therefore, sustainable competence is crucial in the innovative process that emphasizes energy efficiency, recycling, and environmentally friendly behavior in the workplace (Tongsoongnern & Lee, 2022; Khashe et al., 2015).

The second cluster shows that the themes of sustainability and sustainable development are still the main focus in the broader academic narrative. This reflects that many articles in the corpus of this bibliometric study are still macro-oriented, highlighting sustainability as a global phenomenon and organizational policy (Lange & Dewitte, 2019; Kousar et al., 2022). However, this cluster has not explicitly linked the micro dimensions of individual behavior or organizational culture as drivers of sustainability, which are the main focus of this article. This indicates a research gap in the literature, namely the limited studies that integrate the macro context of sustainability with the micro context of organizational behavior and employee competencies (Sawitri et al., 2015; Xu et al., 2023).

The third cluster underlines the importance of pro-environmental behavior as an output of organizational green culture and competence. This position strengthens the theoretical frameworks that support this study, such as the Theory of Planned Behavior and Value-Belief-Norm Theory, which explain that pro-environmental behavior is not only influenced by personal values, but also by social norms formed in the work environment (Qin et al., 2024; Larson et al., 2015). Thus, green organizational culture plays an important role in shaping the social frame of reference that influences employee perceptions and actions (Zhuang & Lederer, 2006).

The novelty of this study lies in the integration of cross-clusters that have been studied separately. Through a bibliometric approach, this study is able to show that sustainable competencies, green innovation, pro-environmental behavior, and green HR policies are not stand-alone entities, but rather part of an interconnected organizational ecosystem (Pechlaner & Fischer, 2006; White et al., 2019). Therefore, this study not only offers a conceptual mapping but also contributes to bridging the fragmented literature (Handayani et al., 2021; Jugdev & Mathur, 2013). With the results of this clustering, researchers and practitioners can better understand how to develop an integrative organizational intervention strategy, from competency development to the formation of a work culture that supports sustainability (Liu, 2022).

2. Network Visualization
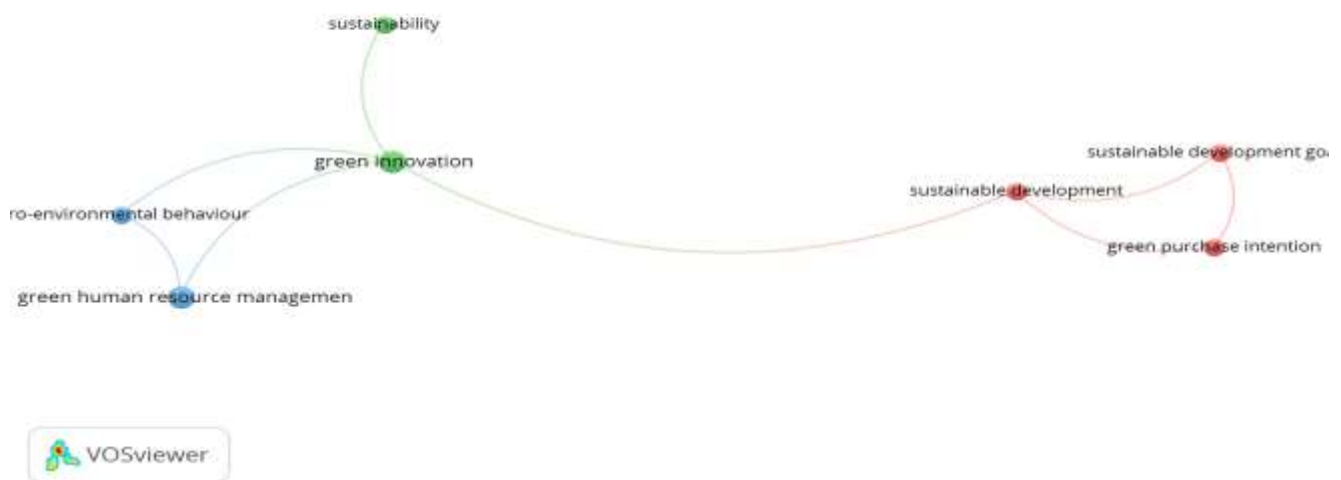
Gambar 1. Network Visualization
Source: Data processed, 2025

Figure 1 illustrates the network visualization of the results of bibliometric analysis using VOSviewer on 177 scientific articles discussing the themes of green shift, sustainable competence, and organizational green culture. This visualization displays the interconnectedness between the most frequently appearing keywords in the analyzed literature, forming a thematic network based on the level of co-existence in the same document. The size of the nodes reflects the frequency of occurrence of keywords, while the connecting lines indicate the strength of the relationship between concepts, determined by the number of documents in which two keywords appear together. Bibliometric analysis plays an important role in mapping and understanding the interconnectedness of themes in the literature, becoming an effective tool in exploring the interactions and developments of thought in this research area (Zhu et al., 2023; Ferasso et al., 2020; Sikandar & Kohar, 2022).

One of the largest nodes in this network is sustainability, which is strongly connected to other keywords such as green innovation, green human resource management, sustainable development, and environmental behavior. This shows that sustainability is a central theme that bridges various conceptual discourses in the field of green organizational management. This connection is in line with the position of

sustainability in the theoretical framework as a large umbrella that covers the dimensions of individual competence and organizational culture as an instrument for its implementation at the micro level. Theoretically, this node strengthens the validity of thinking about the importance of systemic competence in facing the complexity of environmental challenges (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; (Pandithasekara, 2022; as well as support from the Resource-Based View perspective which states that the superiority of green organizations depends on intangible assets such as knowledge and culture (Chang & Chen, 2013; Lozano & Collazzo, 2021).

The keyword green human resource management (GHRM) also stands out and appears to be in a dense network connected to concepts such as employee behavior, training, and competence. This shows that many studies have focused on GHRM strategies in instilling sustainability competence and developing pro-environmental behavior in employees. This finding is in line with studies that identify GHRM as a strategic link between organizational values and individual behavior in the context of sustainability (Imran et al., 2021; (Hussain et al., 2023; Wang et al., 2022). At the same time, this visualization also reveals a relative distance between the keywords organizational culture and sustainable competence, indicating that although the two concepts are often discussed separately, their empirical integration in one model or study is still rare. This is where the research gap raised in this article lies (Ye et al., 2024; Amirbagheri et al., 2018).

In the visual network, the green innovation node has a strong relationship with organizational performance, strategy, and environmental management. This shows the tendency of literature that links green innovation with organizational performance and policies. However, the connection of this concept with competency and culture variables has not been very

intensive, indicating a potential disconnect between structural and behavioral dimensions in previous research approaches (Albort-Morant et al., 2016; Santeramo, 2022). This opens up space for a more comprehensive and cross-disciplinary integration of concepts, as offered in this article (Syarifuddin, 2025; (Pandithasekara, 2022; .

The position of pro-environment behavior in the network appears as a node connected to keywords such as attitude, motivation, and values, reinforcing the relevance of the Theory of Planned Behavior (Ajzen, 1991) and the Value-Belief-Norm Theory (Stern et al., 1999) in explaining how individuals form environmental intentions and actions in the workplace (Filser et al., 2020; Khandelwal et al., 2021). However, the concept of green culture or organizational green culture is still not a major node in this visualization, indicating that the discourse on green culture as a driving factor for behavior is not yet dominant enough in the literature (Viona & Febby, 2025). This condition emphasizes the urgency of research that explicitly links cultural aspects to the formation of competency-based pro-environmental behavior.

Overall, Figure 1 provides an important contribution in detecting hidden conceptual patterns in the literature, identifying key nodes, and revealing the strengths and weaknesses of the relationships between themes. In the context of this study, network visualization is empirical evidence that the literature is still fragmented between strategic (GHRM, innovation), macro-structural (sustainability), and micro-behavioral (pro-environment behavior) approaches (Rifqi & Puspita, 2025; Nabilah & Kumar, 2025; (Hussain et al., 2023; . Therefore, the novelty of this study lies in the effort to integrate these nodes into a more systemic understanding, with a bibliometric approach as a tool to map, assess, and bridge the existing conceptual gaps (Rusydiana et al., 2022; S & Malau, 2022).

3. Overlay Visualization
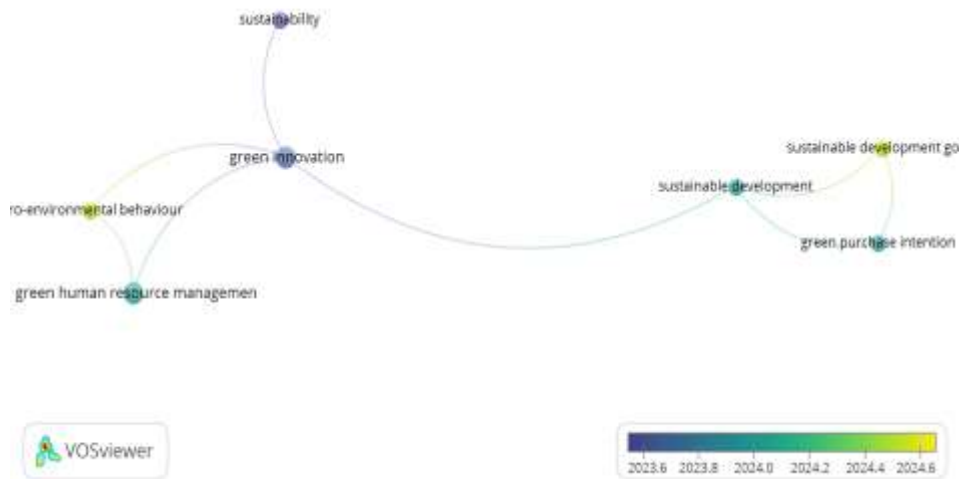
Gambar 2. Overlay Visualization
Source: Data processed, 2025

Figure 2 presents the results of overlay visualization of bibliometric mapping of 177 scientific articles analyzed using VOSviewer software. In bibliometric studies, two common visualization methods commonly used are network visualization that emphasizes the strength of the connection between keywords and overlay visualization that provides a temporal dimension by showing the chronological development of topics in the literature based on the year of their appearance. In this visualization, color is used to indicate the time span related to keywords, where purple and blue depict keywords that were dominant in the early phase (around 2015–2017), while green, yellow to orange represent newer themes (2019–2025) (Kusumaningrum, 2023). Therefore, overlay visualization functions strategically to track the dynamics and evolution of literature related to the study of sustainable competence and green organizational culture.

The visualization results show that keywords such as sustainable development, green innovation, and environmental management dominate the early period, which is seen through the purplish blue color (Syahridhan, 2024) Allur et al. (2018). This indicates that the literature in the early stages is still oriented towards macro and institutional approaches, with a primary focus on developing general sustainability policies and strategies at the organizational or country level. These topics reflect the initial theoretical framework that is heavily influenced by normative approaches such as the Triple Bottom Line (Elkington, 1997) and the environmental management ecosystem (Krishna et al., 2023). The literature in this phase tends to be top-down, emphasizing the role of institutions, policies, and technology in achieving sustainability, but has not been very explorative of the contribution of individual behavior and organizational capacity at the micro level.

Over time, the visualization shows a shift towards more specific, behavioral keywords such as pro-environment behavior, green human resource management, sustainable competence, and green organizational culture, which appear in light green to yellow. This shift reflects a change in approach in sustainability

studies, from structural to more individual and cultural. This indicates a strengthening of integration between behavioral theories, such as the Theory of Planned Behavior (Ajzen, 1991) and Value-Belief-Norm Theory (Stern et al., 1999), with green organizational frameworks such as Green HRM and sustainable competence (Syahridhan, 2024)Allur et al. (2018).

Interestingly, the emergence of the keyword green shift as a node marked in orange indicates a very recent period (2023–2025) indicating that this term has only recently been widely adopted in academic literature. This reinforces the assumption that although green practices have been around for some time, the narrative of cultural and structural shifts towards green organizations is still a new discourse and requires in-depth exploration Allur et al. (2018). It is in this context that the novelty of this article becomes increasingly apparent, with this study attempting to bridge the gap between previous macro-based literature and new narratives that focus on competency-based transformation and work culture.

Overlay visualization also reveals that while topics such as green innovation are quite mature, their linkages to sustainable competence and green culture are still in their early stages of development Allur et al. (2018). This suggests a conceptual and empirical gap in connecting green innovation with human resource elements, such as knowledge, skills, values, and norms that support green practices in the workplace. This exploration reinforces the

importance of a cross-disciplinary approach that integrates human resource management, organizational psychology, and environmental studies within the sustainability framework Allur et al. (2018).

Based on the results of this overlay, the direction of the novelty of the research can be explained more convincingly. This article not only provides an overview of the developing topic map, but also highlights future trends that are still wide open, such as strengthening the connection between green culture and the formation of environmental competence in the organizational ecosystem (Syahridhan, 2024). This study encourages the idea that the green transformation of organizations should be read not only as a policy adaptation, but also as a cultural and competence shift, which requires active employee participation and a repositioning of HR strategies.

Thus, overlay visualization not only serves as a visual aid, but also as a conceptual representation of the evolution of academic thinking on organizational sustainability. It guides researchers and policymakers to map the mature discussion space, while identifying points that still require in-depth exploration Allur et al. (2018) and strengthens the integration between the concepts of competence, organizational culture, and environmental behavior, through systematic mapping based on bibliometrics as its main approach (Syahridhan, 2024).

4. Density Visualization
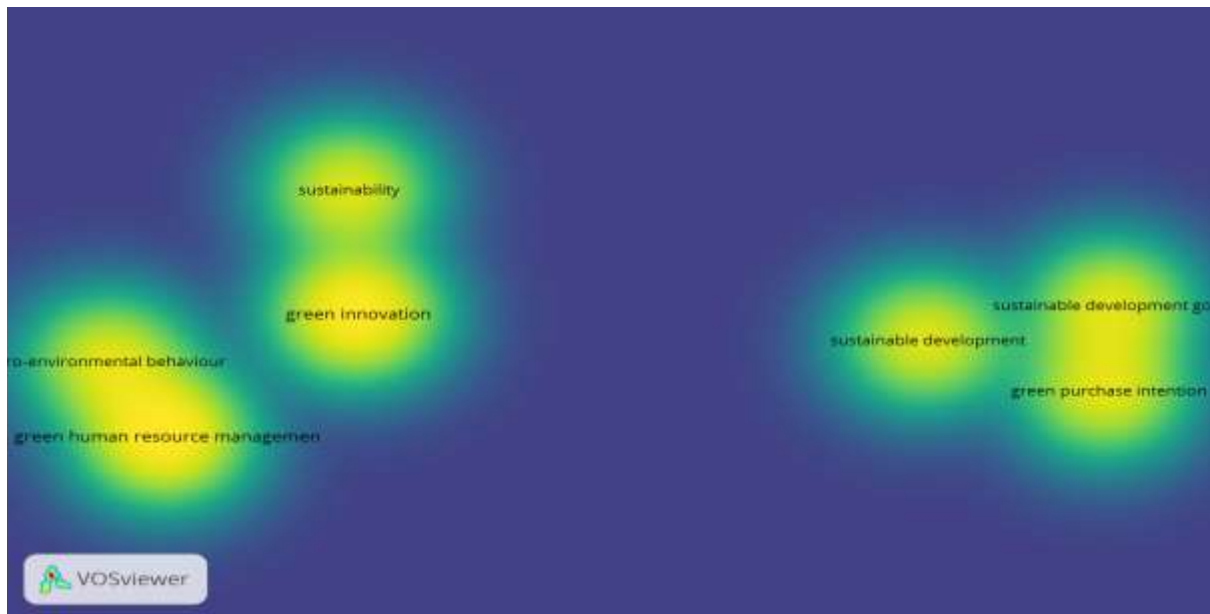
Gambar 3. Density Visualization
Source: Data processed, 2025

Figure 3 presents the density visualization results of the bibliometric analysis using VOSviewer on 177 articles related to the topics of green shift, sustainable competence, and organizational green culture. Different from the two previous visualizations, density visualization displays the level of density of occurrence and connectivity of keywords in the knowledge network. The brighter the color of the area (yellow), the higher the frequency of occurrence and connectivity of the keyword in the analyzed literature. Conversely, dark colors (blue to green) indicate areas with lower connectivity or intensity of occurrence. Therefore, this visualization is very useful for identifying intellectual hotspots in the literature, as well as indicating areas that are still underexplored academically. Previous studies have shown that the use of network visualization techniques can help identify research needs in the context of sustainability and organizational culture, which are often invisible with conventional analysis methods (Kantabutra, 2021; , Suaidy & Manurung, 2023).

From the visualization results, it can be seen that the keywords sustainability, sustainable development, and green innovation are in the brightest areas,

indicating that these themes are the center of literature concentration with the most dominant publication volume and conceptual linkages. This reflects the dominance of the macro approach in sustainability studies, which has so far focused more on institutional strategies, environmental policies, and technological innovation in the context of sustainable development. This finding is in line with previous research results showing that until the mid-2010s, the sustainability discourse still revolved around structural and normative contexts, such as the triple bottom line and corporate social responsibility (CSR) policies (Baumgartner, 2013). The importance of this macro approach is supported by literature that underlines how organizational culture and leadership can influence the success of sustainability initiatives at the macro level (Kiesnere & Baumgartner, 2019).

Interestingly, keywords such as green human resource management and environmental behavior appear in the yellow-to-green area that is starting to lighten, indicating that although these topics are not as popular as macro themes such as sustainable development, both have experienced increasing intensity of study in

recent years. This indicates a shift in focus towards a micro approach that highlights the role of individuals and organizations in internalizing sustainability values. In a theoretical context, this finding strengthens the relevance of the behavioral sustainability approach, which starts from the assumption that organizational change is determined not only by policies and strategies, but also by the competencies, attitudes, and values held by actors within the organization (Maheshwari et al., 2024). Research shows that optimizing human resource competencies and organizational culture is key to creating a work environment that supports better sustainability (Mariyani et al., 2023).

Density visualization also shows that keywords such as sustainable competence and green organizational culture are still in a relatively dark area, with low intensity of connectivity. This indicates that the two concepts have not become the main themes in academic discourse, although conceptually they have important contributions in encouraging pro-environmental behavior and green organizational transformation. This condition confirms the existence of a research gap that is the basis for the justification of this study, namely the lack of systematic exploration of how competence and organizational culture influence each other in shaping sustainable behavior in the workplace (Rustam et al., 2024).

Critically, this phenomenon also shows the thematic bias in sustainability literature that tends to idolize technological innovation or regulation as the main solution. Meanwhile, the role of human resources, especially in the aspects of soft-competence and work culture, has not received a proportionate portion. In fact, other literature has emphasized that green transformation in organizations will not be effective without cultural and competency changes at the individual and collective levels (Baumgartner, 2013).

Therefore, the results of this visualization urge the need for an interdisciplinary approach that integrates the perspectives of human resource management, organizational psychology, and environmental studies to create a more comprehensive sustainability context (Espasandín-Bustelo et al., 2020).

The main strength of this density visualization lies in its ability to visually and intuitively show where the actual position and growth potential of a concept is in the scientific landscape. Based on this visualization, this article is here to contribute to a relatively unexplored area, namely the integration of sustainable competence and green organizational culture in influencing pro-environmental behavior, which in the literature density map is still in the peripheral zone. Therefore, the novelty of this study lies not only in its integrative theme, but also in its courage to expand the yellow zone on the bibliometric map, by focusing on previously under-explored relationships (Goca et al., 2023).

Thus, Figure 3 acts as a strategic map showing opportunities for meaningful academic contributions. It provides visual evidence of the dominance, gaps, and possible directions of literature development, while strengthening the methodological and theoretical positions of this study. Through this density visualization, it can be understood that if we want to strengthen the sustainability literature with a more humane and participatory approach, the study of organizational competence and culture must be elevated to the center of global academic discourse (Cherner et al., 2014).

CONCLUSION

This study comprehensively maps the landscape of scientific literature on sustainable competence and green organizational culture as two important pillars in the formation of pro-environmental behavior in the workplace. Through a bibliometric analysis of 177

articles from Scopus and Google Scholar during the period 2015–2025, it was found that although topics such as sustainability, green innovation, and green human resource management have dominated the discourse, the relationship between individual competence and organizational culture still tends to be marginal and has not become the main focus. The resulting visualization shows that terms such as sustainable competence and green organizational culture do not yet have a strong position as the main node in the literature network, indicating fragmentation and conceptual gaps that need to be bridged. This finding confirms that the integration between macro-structural and micro-behavioral approaches is still weak in efforts to understand organizational transformation towards sustainability. Therefore, this article offers an important theoretical contribution in the form of an integrative approach to combine the dimensions of organizational values, behaviors, and strategies in a single human-based sustainability framework. Thus, this study not only presents a rich intellectual map but also highlights the need for a stronger conceptual and methodological synthesis to address the challenges of organizational sustainability more holistically and systemically.

IMPLICATIONS

The results of this study have important implications in both academic, organizational practice, and institutional policy. At the academic level, this study expands the framework of thinking about sustainability by underlining the importance of integrating sustainable competencies and green organizational culture, which have often been studied separately. For practitioners, these results serve as a basis for designing human resource development strategies that are not only oriented towards technical efficiency, but also towards internalizing ecological values through training, work systems, and the formation of a collective culture that

supports pro-environmental behavior. Organizations are advised to make green culture part of cultural performance indicators and develop incentive systems that encourage voluntary employee involvement. Meanwhile, for policy makers, these findings provide a conceptual basis for formulating policies that encourage the development of a green organizational ecosystem systematically, including through regulation, incentives, and continuing education. By combining micro and macro approaches, this study encourages the creation of cross-sector and cross-disciplinary strategies to strengthen sustainable, adaptive, and human-based green transformation. This opens up space for the development of future organizations that are more environmentally conscious and oriented towards long-term sustainability.

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