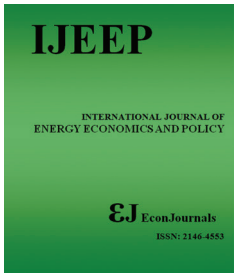

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2026, 16(2), 967-978.

# Organizational Citizenship Behavior and Energy Transition in Energy-Intensive Industries: A Bibliometric Review

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**Received:** 26 October 2025 **Accepted:**24 January 2026 **DOI:** https://doi.org/10.32479/ijeep.22911

**ABSTRACT**

This study aims to analyse the existing literature and identify major research trends at the intersection of organizational citizenship behavior and energy transition in energy-intensive industries. Data were retrieved from the Scopus database and include 155 English-language publications published between 2015 and 2025. A bibliometric analysis was conducted using R Studio (Bibliometrix/Biblioshiny) and VOSviewer to examine publication performance, influential journals and authors, geographical distribution, and thematic structures within the research domain. The results show a rapid expansion of research linking organizational behavior with energy transition, reflecting increasing scholarly attention to the behavioral and organizational dimensions of energy efficiency and low-carbon transition. The literature is mainly published in high-quality journals in energy economics, sustainability, environmental management, and organizational studies. Geographically, research activity is concentrated in Asia and Europe, with China emerging as the most productive contributor, followed by several European countries and other emerging economies. Keyword co-occurrence and thematic mapping identify four major research themes: organizational green management and sustainability foundations; pro-environmental and organizational citizenship behaviors and governance mechanisms; energy efficiency, energy consumption, and low-carbon transition dynamics; and system-level energy transition, policy, and stakeholder governance. The study also outlines future research directions to strengthen the integration of organizational citizenship behavior, energy economics, and sustainability perspectives in energy-intensive industries.

**Keywords:** Organizational Citizenship Behavior, Energy Transition, Energy Efficiency, Energy-intensive Industries, Bibliometric Analysis
**JEL Classifications:** Q40, Q43, D23, M14

## 1. INTRODUCTION

In recent years, the global push toward energy transition has intensified scholarly interest in understanding not only technological and policy-driven pathways, but also the organizational and behavioural foundations that support energy efficiency, carbon reduction, and sustainable energy use in energy-intensive industries. While energy transition has traditionally been examined through the lenses of energy economics, regulation, and innovation, an increasing body of research suggests that organizational processes and employee behaviours play a critical role in translating sustainability strategies into tangible energy and environmental outcomes (Wang et al., 2021; Yang et al., 2022; Lv, 2023).

Within this context, organizational citizenship behavior (OCB), defined as discretionary employee behaviours that go beyond formal job requirements, has emerged as a relevant but still underexplored construct in energy transition research. Prior studies in organizational behaviour demonstrate that citizenship behaviours enhance organizational effectiveness, facilitate change implementation, and support sustainability-related initiatives by encouraging cooperation, proactive problem-solving, and voluntary compliance (Strauss et al., 2017). In energy-intensive industries, such behaviours may be particularly important for promoting energy-saving practices, improving operational efficiency, and supporting organizational responses to environmental regulation.

An emerging stream of interdisciplinary research has begun to connect organizational behaviour with energy and sustainability outcomes. Studies grounded in energy economics and policy highlight how regulatory pressure, resource governance, and economic incentives shape organizational responses to energy transition and environmental performance (Wang et al., 2021; Yang et al., 2022). Complementing this macro-level perspective, research in sustainability and management emphasises the role of organizational practices, green innovation, and circular economy strategies in improving environmental and energy-related performance (Salvioni and Almici, 2020; Kufeoglu, 2022). Recent reviews further highlight the importance of emerging green industries, circular economy practices, and sustainability-oriented innovation in supporting net-zero and energy transition pathways (Nyangchak, 2022; Yin et al., 2023). More recent contributions incorporate financial and institutional dimensions, demonstrating how sustainability-oriented strategies influence firm performance and investment decisions in the context of energy transition (Alatawi et al., 2023; Peng et al., 2022).

Despite these advances, the existing literature remains fragmented across disciplinary boundaries, with limited integration between behavioural perspectives and energy transition research. While several studies acknowledge the importance of employee behaviour and organizational dynamics, organizational citizenship behavior is rarely examined as a central mechanism linking internal management practices to energy efficiency, carbon emissions, and low-carbon transition outcomes. Recent studies increasingly emphasize the behavioral and organizational dimensions of energy transition, highlighting the role of employee engagement and organized citizenship behaviors in supporting sustainability transitions beyond technological solutions (Biresselioglu et al., 2022; de Nigris and Giuliano, 2023). Moreover, empirical contributions are dispersed across energy economics, sustainability, finance, and organizational behaviour journals, making it difficult to identify the dominant research themes, intellectual foundations, and emerging research trajectories of this interdisciplinary field.

To address this gap, the present study conducts a bibliometric analysis of research on organizational citizenship behavior and energy transition in energy-intensive industries, drawing on publications indexed in the Scopus database between 2015 and 2025. By applying performance analysis and science-mapping techniques, this study aims to map the evolution of scholarly output in this domain, identify influential journals, authors, and countries, uncover the main thematic clusters shaping the literature, and highlight emerging research directions at the intersection of organizational behaviour and energy economics. In doing so, the study contributes to a more integrated understanding of how organizational citizenship behavior functions as a micro-level foundation supporting energy transition processes in energy-intensive industries.

## 2. LITERATURE REVIEW

Research on energy transition in energy-intensive industries has developed rapidly, largely driven by concerns over rising energy demand, carbon emissions, and the economic competitiveness of energy-intensive sectors. A substantial body of literature has focused on macro- and meso-level determinants of energy transition, including regulatory pressure, investment in clean technologies, energy pricing, and technological innovation. From an energy economics perspective, studies emphasize the role of environmental regulation, policy instruments, and market-based mechanisms in shaping firms' energy consumption, carbon emissions, and transition pathways. At the firm and industry levels, research has highlighted barriers to energy transition such as high capital intensity, technological lock-in, and trade-offs between environmental performance and competitiveness, particularly in sectors such as manufacturing, oil and gas, and heavy industry.

Alongside these structural and technological perspectives, a growing stream of research has begun to explore the behavioral and organizational dimensions of energy efficiency and energy conservation. This literature shifts attention toward how organizational routines, management practices, and employee actions influence energy-related outcomes. Studies in this stream examine energy-saving behavior, compliance with energy management systems, and pro-environmental behavior in the workplace, suggesting that technical solutions alone are insufficient without supportive organizational and behavioral conditions. From this viewpoint, energy efficiency is increasingly understood as a socio-organizational process, in which employees' day-to-day behaviors, cooperation, and voluntary engagement play an important role in reducing energy use and improving environmental performance. From this perspective, energy transition is increasingly conceptualized as a socio-organizational process shaped by behavioral, institutional, and organizational factors (Biresselioglu et al., 2022).

Parallel to developments in the energy literature, research in organizational behavior and sustainability has extensively examined organizational citizenship behavior (OCB) in contexts related to social and environmental responsibility. This stream of research conceptualizes OCB as discretionary employee behavior that supports organizational effectiveness beyond formal job requirements, including cooperation, initiative, voice behavior, and voluntary compliance. In sustainability-oriented contexts, scholars have increasingly focused on environmentally oriented OCB, pro-social and pro-environmental citizenship behaviors, and moral or ethical voice, highlighting how employees voluntarily contribute to organizational sustainability goals. These studies demonstrate that OCB can facilitate the implementation of sustainability initiatives by encouraging employees to go beyond minimum compliance and actively support organizational change (Afaneh et al., 2023). Empirical evidence also shows that green human resource management, green digital leadership, and digital transformation significantly enhance environmental and sustainability performance, particularly in energy-intensive and manufacturing contexts (Alabdali et al., 2024; Wang and Makhbul, 2024; Lin et al., 2024). Prior studies further demonstrate that leadership styles and regulatory contexts influence pro-environmental behavior and organizational citizenship behavior, thereby shaping environmental and energy-related outcomes (Zafar et al., 2022; Hasan et al., 2024).

Despite these parallel developments, the energy transition literature and the OCB literature have largely evolved in isolation. While studies on energy transition increasingly acknowledge the importance of organizational and behavioral factors, they rarely place OCB at the center of analysis. Conversely, research on OCB in sustainability contexts tends to focus on social responsibility, environmental behavior, or ethical outcomes without explicitly linking these behaviors to concrete energy-related outcomes such as energy efficiency, energy consumption, or carbon emissions in energy-intensive industries. As a result, existing research provides fragmented insights, with limited integration between employee-level discretionary behaviors and system-level energy transition processes.

Taken together, the literature reveals a clear gap in the form of a missing integrated and systematic perspective that connects organizational citizenship behavior with energy transition and energy efficiency in energy-intensive industries. Addressing this gap requires moving beyond single-discipline approaches and adopting a comprehensive view that links behavioral mechanisms, organizational practices, and energy-related outcomes. A systematic bibliometric approach is therefore well suited to synthesizing existing knowledge, mapping the intellectual structure of this interdisciplinary field, and identifying dominant themes and emerging research directions at the intersection of organizational citizenship behavior and energy transition.

## 3. METHODS

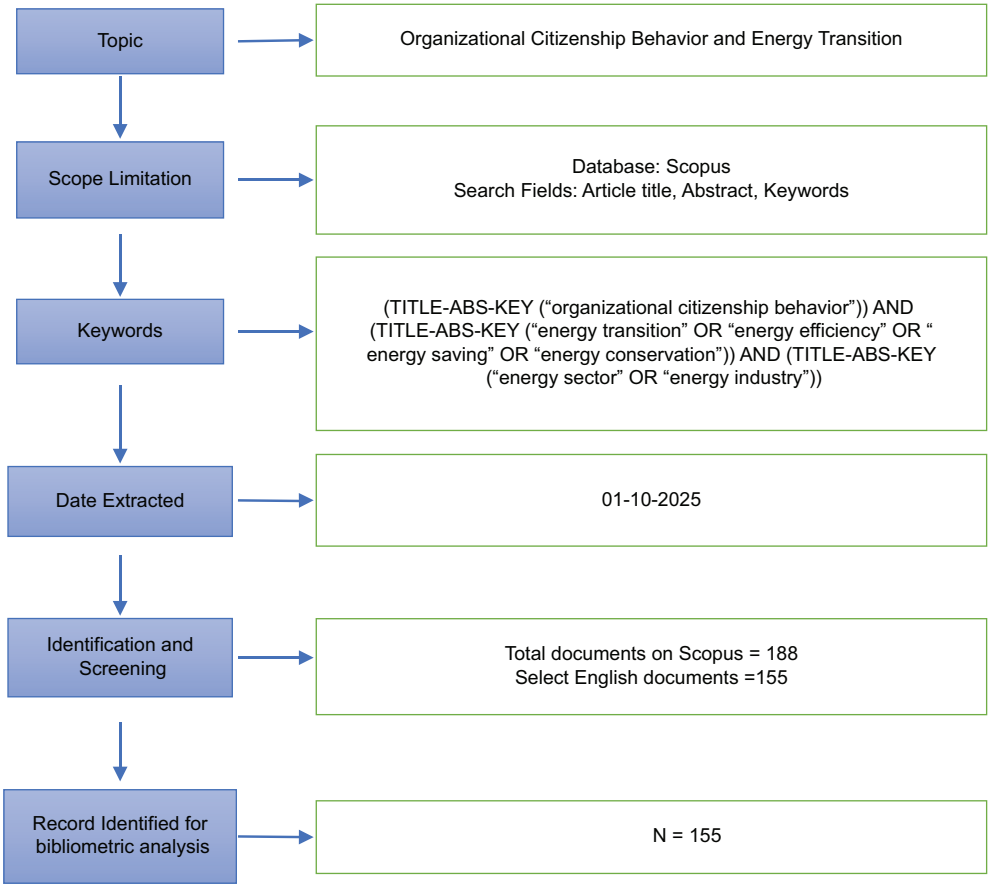
To establish the final dataset for analysis, this study followed the research procedure illustrated in Figure 1. Data were collected from the Scopus database using a structured search strategy applied to the article title, abstract, and keywords fields. The search query was formulated as follows:

(TITLE-ABS-KEY (“organizational citizenship behavior”)) AND (TITLE-ABS-KEY (“energy transition” OR “energy efficiency” OR “energy saving” OR “energy conservation”)) AND (TITLE-ABS-KEY (“energy sector” OR “energy industry”)).

This query was designed to capture studies explicitly addressing organizational citizenship behavior in the context of energy-related transitions and efficiency initiatives, with a specific focus on energy-intensive sectors and industries.

The search retrieved publications covering the period from 2015 to 2025. Following the initial retrieval, the documents were screened according to predefined inclusion criteria. Only peer-reviewed publications written in English were retained, while non-English documents and records not directly related to organizational citizenship behavior and energy transition were excluded. After this refinement process, a total of 155 documents remained and constituted the final dataset for subsequent bibliometric analysis.

**Figure 1:** Research procedure



The analytical process began with a descriptive statistical analysis to provide an overview of the research landscape on organizational citizenship behavior and energy transition in energy-intensive industries. This stage examined publication growth, citation patterns, document types, contributing countries, leading sources, and collaboration networks. These analyses were conducted using Biblioshiny, the web-based interface of the Bibliometrix package in R, which was employed to generate and visualise the main bibliometric indicators.

Subsequently, co-citation and keyword co-occurrence analyses were performed using VOSviewer (version 1.6.20). These techniques enabled the identification of groups of documents sharing similar citation patterns and conceptual linkages, thereby mapping the intellectual and thematic structure of the field. Based on the resulting clusters, the dominant research themes and emerging directions were identified and interpreted, providing a systematic overview of how organizational citizenship behavior has been examined within the broader discourse on energy transition and energy efficiency in energy-intensive industries.

## 4. RESULTS AND DISCUSSION

Table 1 summarises the main descriptive statistics of the dataset analysed in this study. The bibliometric review covers 155 documents published between 2015 and 2025, collected from 88 academic sources, including peer-reviewed journals, books, and edited volumes. The dataset exhibits a high annual growth rate of 49.83%, indicating rapidly increasing scholarly interest in the intersection of organizational behaviour and energy transition. The average document age of 1.51 years suggests that the literature is relatively recent and continues to evolve actively. On average, each publication has received 15.08 citations, reflecting a moderate but growing level of academic impact. In total, the corpus contains 1,377 references, along with 781 Keywords Plus (ID) and 582 Author's Keywords (DE), highlighting the conceptual richness and thematic diversity of research linking organizational citizenship behaviour with energy and sustainability transitions.

Figure 2 shows the annual evolution of publications and citations on organizational citizenship behavior and energy transition in energy-intensive industries from 2015 to 2025. During the early period (2015–2016), research activity was minimal, with only one publication in 2015 and none in 2016, accompanied by limited citation counts. Between 2017 and 2018, publication output remained low at two articles per year, while citation activity increased substantially, indicating the presence of early influential studies. No publications were recorded in 2019, followed by a citation peak in 2020 despite a small number of articles.

From 2021 onward, publication output expanded rapidly, rising from eight articles in 2021 to a peak of 57 articles in 2025. In contrast, citation counts declined in recent years, reflecting the time lag required for newly published studies to accumulate citations. The overall pattern suggests a transition from an early phase dominated by a few high-impact publications to a recent phase characterised by rapid growth in research output.

**Table 1: Main information of data**

| Timespan | 2015–2025 |
|---|---|
| Sources (Journals, Books, etc.) | 88 |
| Documents | 155 |
| Annual growth rate (%) | 49.83 |
| Document average age | 1.51 |
| Average citations per document | 15.08 |
| References | 1,377 |
| Keywords plus (ID) | 781 |
| Author's keywords (DE) | 582 |

### 4.1. Countries' Scientific Production

Figure 3 illustrates the distribution of global scientific production related to organizational citizenship behavior and energy transition in energy-intensive industries. China is the most prolific contributor, with 126 publications, highlighting its dominant role in advancing research at the intersection of organizational behavior, sustainability practices, and energy transition. This strong research output reflects China's strategic emphasis on energy efficiency, carbon reduction, and organizational responses within energy-intensive sectors.

India ranks second with 37 publications, followed by Pakistan and the United Kingdom, each contributing 30 publications, and Malaysia with 29 publications. These countries represent both emerging and developed economies, indicating broad scholarly engagement with behavioral and organizational aspects of energy transition. Further contributions come from Indonesia, Poland, and

**Figure 2:** Number of documents and citations

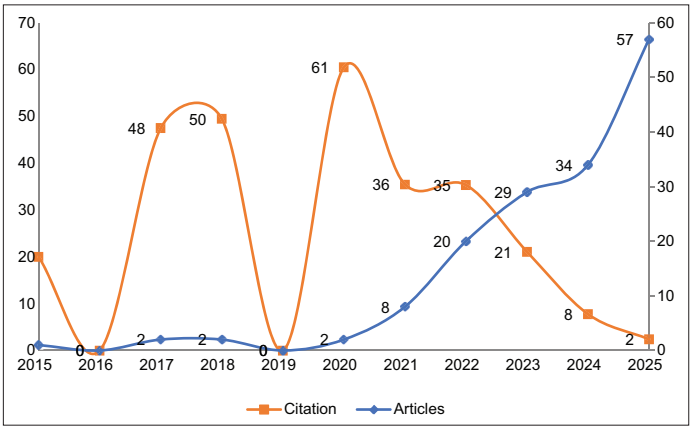
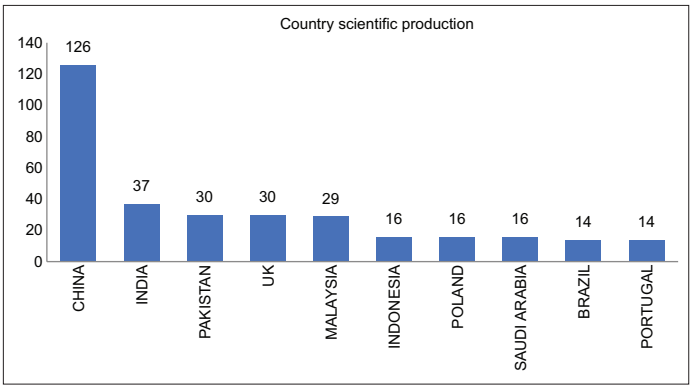



**Figure 3:** Countries' scientific production



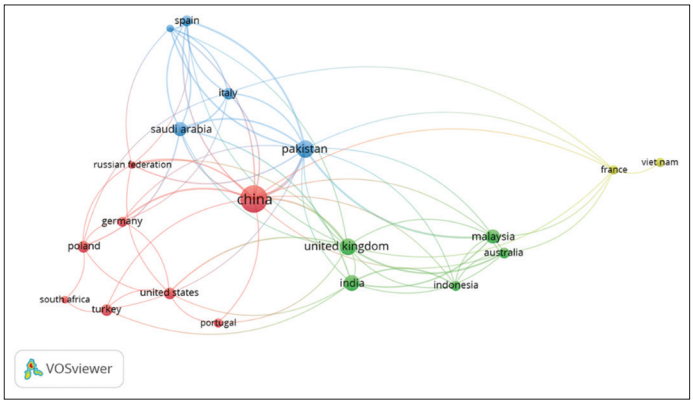
Saudi Arabia, each with 16 publications, while Brazil and Portugal each account for 14 publications.

Overall, the distribution reveals a clear concentration of research output in Asia, particularly in China and South Asia, alongside meaningful participation from European countries. This pattern underscores the global relevance of organizational citizenship behavior in facilitating energy transition processes, while also reflecting regional differences in energy intensity, industrial structures, and sustainability priorities.

Figure 4 presents the country-level co-authorship network generated using VOSviewer, illustrating patterns of international research collaboration in the literature on organizational citizenship behavior and energy transition in energy-intensive industries. Only countries meeting the predefined inclusion criteria are visualised. The network is organised into four collaboration clusters, revealing distinct regional and cross-regional cooperation dynamics within this research domain.

- Cluster 1 is centred on China, which occupies the most prominent and central position in the network. China exhibits strong collaborative ties with several countries, including Germany, the United States, Poland, Turkey, and South Africa, underscoring its role as a major hub facilitating international research on organizational behavior, sustainability, and energy-related challenges in energy-intensive industries.
- Cluster 2 is formed around Pakistan, which functions as an important intermediary linking research efforts across Southern Europe and the Middle East, notably with Italy, Spain, and Saudi Arabia. This cluster reflects increasing collaboration between emerging and developed economies, particularly in studies addressing governance mechanisms, organizational behavior, and environmental management within energy transition contexts.
- Cluster 3 centres on the United Kingdom, with close collaborative links to India, Malaysia, Indonesia, and Australia. This cluster represents a cross-regional network spanning Europe and the Asia–Pacific region, highlighting interdisciplinary research that integrates organizational citizenship behavior with energy efficiency and policy-oriented perspectives on energy transition.
- Cluster 4 comprises France and Vietnam, forming a smaller but distinct collaboration group. Despite its limited size, this cluster maintains connections with the broader network through ties to major hub countries, indicating the increasing engagement of both European and Southeast Asian research contexts in this field.

**Figure 4:** Network visualization map of the co-authorship by countries



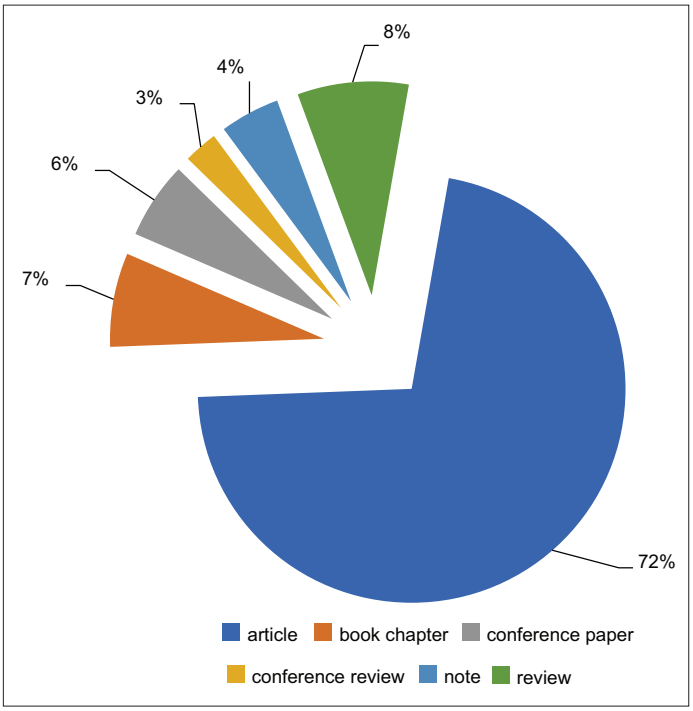

Taken together, the co-authorship network indicates that international collaboration in research on organizational citizenship behavior and energy transition is structured around a small number of influential countries particularly China, Pakistan, and the United Kingdom which play a key role in connecting regional research communities. These patterns reflect the increasingly global and cross-regional character of the field, alongside the growing involvement of emerging economies in advancing energy transition research within energy-intensive industries.

## 4.2. Types of Documents

Figure 5 illustrates the distribution of publication types in the literature on organizational citizenship behavior and energy transition in energy-intensive industries. Journal articles clearly dominate the dataset, accounting for 72% of total publications, indicating that scholarly contributions in this field are primarily disseminated through peer-reviewed academic journals. This dominance reflects the central role of journals in advancing theory-driven and empirically grounded research on behavioral and organizational dimensions of energy transition.

Other publication types play a complementary role. Review articles constitute 8% of the dataset, suggesting increasing efforts to synthesise and consolidate existing knowledge. Book chapters account for 7%, while conference papers represent 6%, highlighting additional academic discussion through edited volumes and conference platforms. In contrast, research notes (4%) and conference reviews (3%) appear less frequently, indicating

**Figure 5:** Statistics by the type of published documents



their more limited role in shaping the core knowledge base of the field.

This publication structure is characteristic of a research domain that has reached a stage of methodological and conceptual consolidation, where peer-reviewed journal articles function as the primary vehicle for theoretical refinement and empirical validation, while other formats mainly support dissemination and integrative reflection.

Table 2 presents the distribution of publications across the most influential academic sources contributing to the literature on organizational citizenship behavior and energy transition in energy-intensive industries. The results indicate that Environmental Science and Pollution Research and Sustainability (Switzerland) are the two most prominent outlets, each publishing 11 articles, underscoring their central role in disseminating research at the intersection of environmental sustainability, organizational practices, and energy-related outcomes. The strong presence of these journals reflects the growing integration of behavioral and organizational perspectives into sustainability- and energy-focused research.

Following these leading outlets, the International Journal of Energy Sector Management contributed 5 publications, highlighting its relevance as a key platform for studies linking organizational behavior with energy management and sectoral transition issues. Several other journals, including Business Strategy and the Environment, Energies, and the Journal of Cleaner Production, each published 4 articles, indicating increasing scholarly attention to strategic, technological, and organizational dimensions of energy transition.

**Table 2: Top 10 Journals Publishing Research on Organizational Citizenship Behavior and Energy Transition**

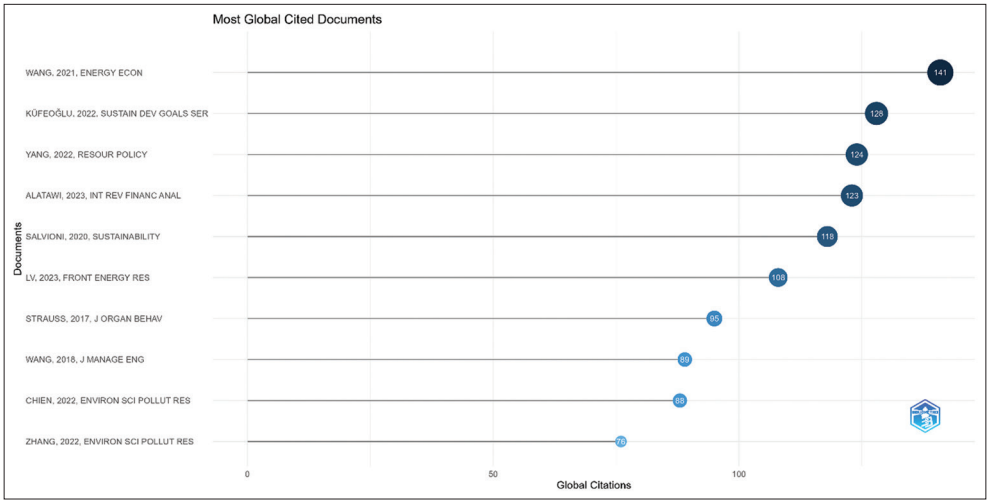
| Sources | Articles |
|---|---|
| Environmental Science and Pollution Research | 11 |
| Sustainability (Switzerland) | 11 |
| International Journal of Energy Sector Management | 5 |
| Business Strategy and the Environment | 4 |
| Energies | 4 |
| Journal of Cleaner Production | 4 |
| Frontiers in Energy Research | 3 |
| International Journal of Environmental Research and Public Health | 3 |
| Resources Policy | 3 |
| Sustainable Futures | 3 |

Additionally, journals such as Frontiers in Energy Research, International Journal of Environmental Research and Public Health, Resources Policy, and Sustainable Futures each contributed 3 publications. Although their contributions are more modest in volume, they demonstrate the multidisciplinary nature of this research field, spanning energy economics, environmental policy, public health, and sustainability studies. Overall, the distribution suggests that research on organizational citizenship behavior and energy transition is expanding across diverse academic communities, with sustainability- and energy-oriented journals playing a particularly prominent role.

Figure 6 and Table 3 jointly present the most globally cited publications in the literature on organizational citizenship behavior and energy transition in energy-intensive industries, thereby identifying the studies that have exerted the greatest scholarly influence on the development of this research domain. Overall, the citation distribution reveals a clear concentration of academic impact around a relatively small number of highly cited works, which have played a pivotal role in shaping theoretical foundations and empirical investigations linking organizational behavior, sustainability practices, and energy-related outcomes.

The most influential publication is Wang et al. (2021), published in Energy Economics, with 141 global citations. This study stands out as a foundational contribution by demonstrating how environmental regulation and economic mechanisms influence pollution control and energy-related outcomes, providing a macro-level economic framework that has informed subsequent research on energy transition. Closely following, Kufeoglu (2022) in Sustainable Development Goals Series and Yang et al. (2022) in Resources Policy, with 128 and 124 citations respectively, highlight the growing importance of sustainability-oriented

**Figure 6:** Most cited documents



innovation, energy policy, and resource governance in supporting low-carbon transition pathways.

Several other highly cited studies further illustrate the interdisciplinary nature of the field. Alatawi et al. (2023) in International Review of Financial Analysis (123 citations) and Salvioni and Almici (2020) in Sustainability (118 citations) extend the discussion by linking sustainability practices, corporate responsibility, and financial and non-financial performance, thereby bridging organizational behavior with energy and environmental outcomes. Similarly, Lv (2023) in Frontiers in Energy Research (108 citations) reflects increasing scholarly attention to energy transition challenges and opportunities from a systems and policy perspective.

**Table 3: Top ten studies with the highest citation**

| Title | Authors | Total Citation |
|---|---|---|
| Can environmental regulation solve pollution problems? | Wang et al. (2021) | 141 |
| Emerging Technologies: Value Creation for Sustainable Development | Kufeoglu (2022) | 128 |
| Economic impact of crude oil supply disruptions | Yang et al. (2022) | 124 |
| CSR, financial and non-financial performance in emerging markets | Alatawi et al. (2023) | 123 |
| Transitioning toward a circular economy: The impact of sustainability practices | Salvioni and Almici (2020) | 118 |
| Transitioning to sustainable energy: opportunities and challenges | Lv (2023) | 108 |
| Fifty shades of green: How microfoundations of CSR shape employee behavior | Strauss et al. (2017) | 95 |
| Impact of institutional pressures on organizational behavior | Wang et al. (2018) | 89 |
| Environmentally Specific Servant Leadership and Employees' Energy-Specific Pro-Environmental Behavior: Evidence from Healthcare Sector of a Developing Economy | Peng et al. (2022) | 74 |
| Emerging green industries toward a net-zero economy: A systematic review | Nyangchak, N. (2022) | 69 |

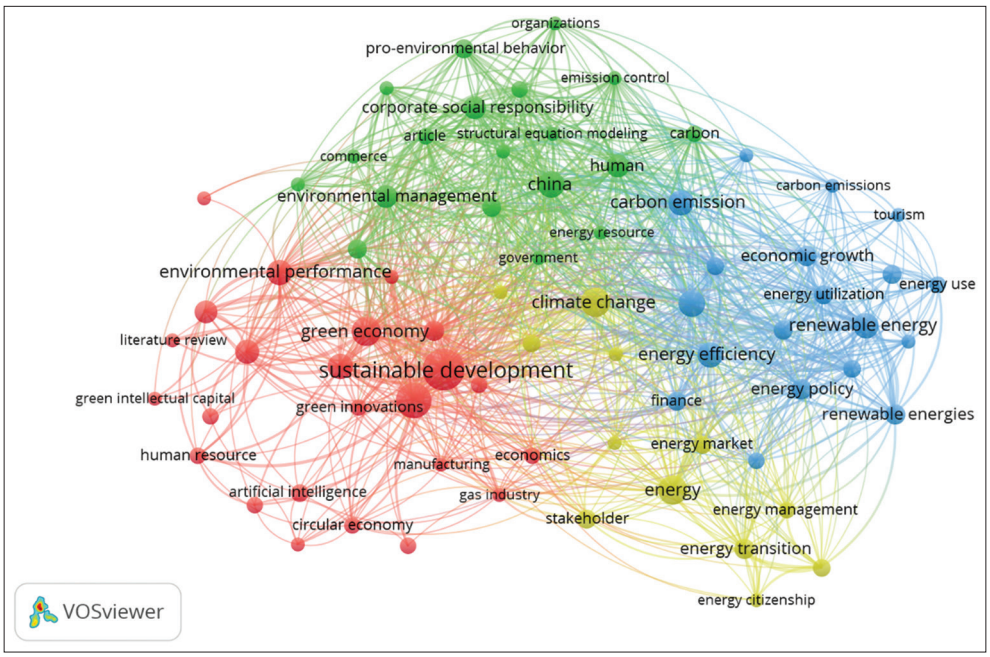
In addition, influential contributions such as Strauss et al. (2017) in Journal of Organizational Behavior (95 citations) and Wang et al. (2018) in Journal of Management in Engineering (89 citations) introduce a micro- and meso-level behavioral lens, emphasizing how organizational citizenship behavior, institutional pressures, and employee actions shape sustainability and energy-related performance. More recent studies, including Peng et al. (2022) and Nyangchak (2022) in Environmental Science and Pollution Research, although having comparatively lower citation counts, signal emerging research directions that explicitly connect energy efficiency, climate change mitigation, and organizational and financial mechanisms.

Taken together, the combined evidence from Figure 7 and Table 3 suggests that research on organizational citizenship behavior and energy transition has been strongly shaped by a core set of highly cited studies published in leading energy economics, sustainability, and management journals. These works collectively establish the intellectual foundations of the field, integrating macro-level energy and policy perspectives with micro-level organizational and behavioral insights, and providing a robust basis for more recent studies focusing on employee-driven and organizational pathways to energy transition in energy-intensive industries.

### 4.3. Co-occurrence of Author Keywords

Based on the keyword co-occurrence analysis conducted using VOSviewer, four distinct research clusters were identified within the literature on organizational citizenship behavior and energy transition in energy-intensive industries. Figure 7 visualizes the network of co-occurring keywords and illustrates the structural

**Figure 7:** The network of co-occurring keywords



relationships among the main research themes, while each cluster represents a coherent set of interrelated concepts reflecting the dominant thematic orientations and intellectual structure of the field.

- Cluster 1 focuses on organizational green management and sustainability foundations, highlighting themes such as green human resource management, green innovation, circular economy, digital transformation, and sustainable performance. This cluster emphasizes the role of organizational capabilities, human resource systems, and sustainability-oriented management practices in establishing the internal conditions necessary for environmentally responsible and energy-efficient operations in energy-intensive industries.

Within this cluster, two dominant sub-themes emerge. The first sub-theme focuses on green human resource management and green innovation as drivers of sustainable performance, highlighting the strategic role of human capital and organizational innovation in supporting environmentally responsible operations. The second sub-theme emphasizes digital transformation, circular economy practices, and sustainability-oriented organizational strategies, reflecting the growing integration of technological and managerial approaches to enhance energy efficiency and long-term sustainability in energy-intensive industries.

- Cluster 2 centres on behavioral, organizational, and governance drivers of environmental and energy outcomes, with strong emphasis on corporate social responsibility, leadership, pro-environmental behavior, and government regulation. Research in this cluster adopts a micro- to meso-level perspective, examining how organizational citizenship behavior and related pro-environmental behaviors translate sustainability intentions into concrete actions that support energy conservation and environmental management. These patterns are consistent with prior findings showing that government regulation, corporate social responsibility, and governance mechanisms significantly shape organizational environmental performance and energy conservation behaviors in energy-intensive industries (Sahin, 2022; Teti, 2022; Ellili, 2023; Enciso-Alfaro, 2023; Boulhaga, 2023)

This cluster can be further divided into two interrelated sub-themes. The first sub-theme centres on corporate social responsibility, leadership, and pro-environmental behavior, underscoring how organizational citizenship behavior functions as a micro-level mechanism translating sustainability values into everyday workplace practices. The second sub-theme highlights the role of government regulation and organizational environmental management systems, illustrating how behavioral processes are shaped and reinforced by governance and institutional contexts (Zou and Wang, 2024).

- Cluster 3 addresses energy efficiency and low-carbon transition dynamics, linking energy consumption, energy efficiency, carbon emissions, renewable energy investment, and economic development. Studies within this cluster primarily adopt an energy economics perspective, focusing on measurable energy and carbon outcomes and highlighting the economic implications of behavioral and organizational mechanisms in the transition toward low-carbon energy systems.

Two main sub-themes characterize this cluster. One sub-theme examines the relationship between energy consumption, energy efficiency, and carbon emissions in the context of economic growth, reflecting core concerns of energy economics. The other sub-theme focuses on renewable energy investment, energy policy, and financial mechanisms, highlighting the economic and institutional conditions that facilitate low-carbon energy transition (Zhou, 2025). Similar relationships between energy efficiency, energy consumption structures, and carbon emissions have been widely documented in energy-intensive sectors and low-carbon transition contexts (Hong et al., 2022; Lee et al., 2022; Pham et al., 2024).

- Cluster 4 reflects a system-level energy transition and governance orientation, concentrating on energy markets, energy management, environmental regulation, stakeholder engagement, and energy citizenship. This cluster underscores the importance of institutional frameworks, market structures, and stakeholder participation in shaping the implementation of energy transition pathways, particularly in energy-intensive sectors such as oil, gas, and manufacturing.

This cluster also reveals two complementary sub-themes. The first sub-theme addresses energy markets, energy management practices, and environmental regulation as key system-level enablers of energy transition. The second sub-theme emphasizes stakeholder engagement and energy citizenship, highlighting the participatory and governance dimensions of implementing energy transition pathways in energy-intensive industries. This system-level orientation aligns with recent research on energy citizenship, stakeholder participation, and governance frameworks, which emphasizes the importance of inclusive and participatory mechanisms in shaping energy transition pathways (Schlindwein and Montalvo, 2023; Silvast and Valkenburg, 2023; Otto and Oberthur, 2024).

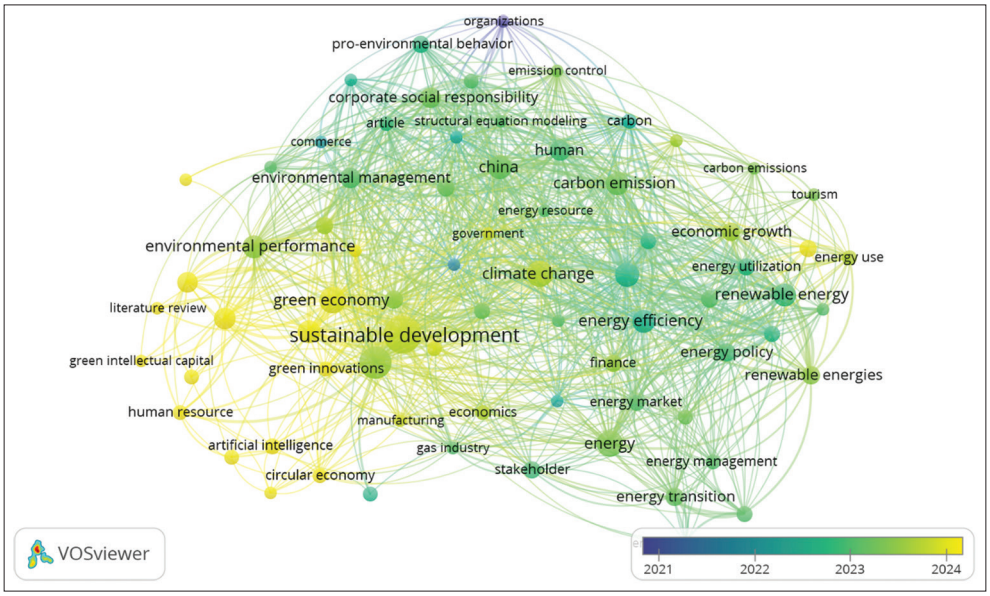
Taken together, the four clusters demonstrate that research on organizational citizenship behavior and energy transition is thematically interconnected and multi-level, spanning organizational capabilities and green management foundations, micro-level employee behaviors and governance mechanisms, economic and energy-related outcomes, and system-level energy transition governance. In summary, organizational green management practices (Cluster 1) establish the internal conditions that enable pro-environmental and organizational citizenship behaviors (Cluster 2), which subsequently influence energy efficiency, energy consumption, and carbon-related outcomes (Cluster 3). These micro-level behavioral mechanisms are embedded within broader energy markets, governance frameworks, and stakeholder dynamics that ultimately shape the implementation of energy transition pathways in energy-intensive industries (Cluster 4), as summarized in Table 4.

Figure 8 illustrates the temporal evolution of keyword co-occurrence in the literature on organizational citizenship behavior

**Table 4: Summary of keyword clusters, themes, and sub-themes**

| Cluster | Keywords | Theme | Sub-theme |
|---|---|---|---|
| Cluster 1 | 24 keywords: Artificial intelligence, circular economy, digital transformation, economics, environmental economics, environmental performance, gas industry, green development, green economy, green human resource management, green innovation, green innovations, green intellectual capital, human resource, innovation, literature review, management, manufacturing, perception, recycling, sustainability, sustainable development, sustainable performance, systematic literature review | Organizational Green Management and Sustainability Foundations | 1. Green human resource management, green innovation, and sustainable performance outcomes<br>2. Digital transformation, circular economy, and organizational strategies for sustainability and energy conservation |
| Cluster 2 | 19 keywords: Article, carbon, carbon footprint, China, commerce, corporate social responsibility, emission control, energy conservation, energy resource, environmental impact, environmental management, government, human, leadership, organization, organizations, pro-environmental behavior, social responsibility, structural equation modeling | Behavioral, Organizational, and Governance Drivers of Environmental and Energy Outcomes | 1. Corporate social responsibility, leadership, and pro-environmental behavior in shaping environmental performance<br>2. Government regulation and organizational environmental management mechanisms influencing energy conservation |
| Cluster 3 | 19 keywords: Alternative energy, carbon dioxide, carbon emission, carbon emissions, COVID-19, economic and social effects, economic development, economic growth, energy consumption, energy efficiency, energy policy, energy sector, energy use, energy utilization, finance, investments, renewable energies | Energy Efficiency, Economic Development, and Low-Carbon Transition Dynamics | 1. Energy consumption, efficiency, and carbon emissions in economic growth and development contexts<br>2. Energy policy, renewable energy investment, and financial mechanisms supporting low-carbon energy transition |
| Cluster 4 | 12 keywords: Climate change, energy, energy citizenship, energy management, energy market, energy transition, energy transitions, environmental protection, environmental regulation, oil industry, spatiotemporal analysis, stakeholder | Energy Transition Governance, Markets, and Stakeholder Engagement | 1. Energy markets, management practices, and regulatory frameworks facilitating energy transition<br>2. Stakeholder engagement, energy citizenship, and sector-specific transition pathways in energy-intensive industries |

**Figure 8:** Keyword co-occurrence evolution




and energy transition in energy-intensive industries, using an overlay visualization generated by VOSviewer. The colour gradient from darker blue to lighter green and yellow represents the average publication year of keywords between 2021 and 2024, enabling the identification of shifts in research focus over this period.

During the earlier stage of the observed period (around 2021), as indicated by darker blue–coloured keywords, research primarily concentrated on organizational and governance-related foundations, including corporate social responsibility, leadership, pro-environmental behavior, organizational management, and environmental management. This phase reflects an initial emphasis on understanding how organizational practices and governance mechanisms shape environmentally responsible behavior within organizations.

In the subsequent stage (approximately 2022), represented by greener-coloured keywords, the research focus gradually shifted toward energy- and economy-oriented themes. Keywords such as energy consumption, energy efficiency, carbon emissions, energy policy, economic growth, and energy markets became

more prominent, indicating increasing integration between organizational and behavioral perspectives and energy economics, particularly in relation to carbon-related outcomes and energy performance.

In the most recent stage of the literature (around 2023–2024), as reflected by light green and yellow-coloured keywords, growing attention is given to sustainability-oriented and transition-focused themes, including sustainable development, green economy, renewable energy, energy transition, energy management, and energy citizenship. This shift highlights a stronger emphasis on the behavioral and organizational micro-foundations of energy transition, with particular focus on how organizational citizenship behavior, human resources, and stakeholder engagement contribute to the implementation of energy transition pathways in energy-intensive industries.

Overall, Figure 8 reveals a clear temporal progression in the literature from organizational and governance foundations (2021) toward energy-economic outcomes (2022), and more recently toward sustainability-driven and behaviorally grounded analyses of energy transition (2023–2024). This evolution underscores the increasing recognition of organizational citizenship behavior as a critical micro-level mechanism linking organizational practices with energy efficiency, carbon reduction, and broader system-level energy transition processes.

### 4.4. Discussion and Future Research

The findings of this bibliometric analysis provide a comprehensive overview of how research on organizational citizenship behavior and energy transition in energy-intensive industries has evolved over time, both conceptually and thematically. The results indicate that the literature has gradually moved beyond a predominantly technological and policy-driven understanding of energy transition toward a more integrated and behaviour-oriented perspective, as reflected in recent energy economics and sustainability studies (Wang, 2021; Yang et al., 2022). This evolution reflects growing recognition that energy transition is not only shaped by regulation, investment, and technology, but also by organizational processes and discretionary employee behaviours that influence how energy-related strategies are implemented in practice (Kufeoglu, 2022; Salvioni, 2020).

A central insight emerging from the analysis is the increasing importance of organizational and behavioural mechanisms in energy transition research. Rather than focusing solely on energy systems, emissions, or macroeconomic indicators, a substantial body of studies examines how organizational practices and employee behaviours contribute to outcomes such as energy efficiency, energy conservation, and environmental performance (Peng et al., 2022; Nyangchak, 2022). In this context, organizational citizenship behavior appears as a critical micro-level construct that supports cooperation, voluntary compliance, proactive problem-solving, and engagement with energy-saving initiatives, consistent with foundational insights from organizational behaviour research (Strauss et al., 2017).

Another prominent theme highlighted by the results is the growing integration of energy transition research with sustainability-oriented and organizational capability perspectives. Recent studies increasingly link energy efficiency and low-carbon transition to green innovation, circular economy strategies, and sustainability management practices (Salvioni, 2020; Kufeoglu, 2022). This shift indicates a move away from viewing energy transition as an isolated technical challenge, toward understanding it as an organizational transformation process that requires alignment between strategic objectives, internal management systems, and employee behaviour. Within this perspective, energy transition is increasingly framed as a socio-organizational process rather than a purely technological or economic one (Lv et al., 2023).

The bibliometric findings also underscore the relevance of governance, leadership, and institutional contexts in shaping the relationship between organizational behaviour and energy-related outcomes. Prior studies highlight how regulatory environments, stakeholder pressures, and governance mechanisms condition the effectiveness of organizational initiatives related to energy efficiency and environmental management (Yang et al., 2022; Wang, 2018). These contextual factors influence whether employees perceive energy transition initiatives as legitimate, meaningful, and worth supporting through discretionary behaviours such as organizational citizenship behavior and voluntary environmental engagement.

In addition, the results reveal a clear geographical shift toward emerging and transitional economies, particularly in Asia. Countries such as China, India, Pakistan, and Vietnam appear prominently in the literature, reflecting the growing importance of energy-intensive industries in these contexts and the urgency of balancing economic development with sustainability goals (Wang, 2021; Peng et al., 2022). This trend contributes to a more context-sensitive understanding of energy transition, highlighting how institutional conditions, industrial structures, and workforce characteristics shape the role of organizational behaviour in supporting energy-related change.

These findings suggest that research on organizational citizenship behavior and energy transition has developed into a multi-level and interdisciplinary field that bridges energy economics, sustainability studies, and organizational behaviour. The literature increasingly recognises that successful energy transition depends on the interaction between macro-level policies and markets, organizational-level practices and capabilities, and micro-level employee behaviours. Organizational citizenship behavior emerges as a key behavioural mechanism linking internal organizational dynamics with broader energy efficiency, carbon reduction, and transition outcomes in energy-intensive industries (Strauss et al., 2017; Alatawi et al., 2023).

Building on the thematic patterns and research gaps identified through the bibliometric analysis, this study proposes several directions for future research. Future research should further examine employee green behavior and its contribution to sustainability performance in energy-intensive settings, particularly under increasing energy transition pressures (Bhuiyan et al., 2025). First, future studies should examine how

digitalisation and digital energy management systems influence employee citizenship behaviours related to energy efficiency and conservation. Second, more research is needed on the role of organizational citizenship behavior in supporting employee engagement, sustainable performance, and investment efficiency during energy transition processes (Alatawi et al., 2023). Third, scholars could further explore environmentally oriented forms of citizenship behaviour, including voluntary energy-saving practices and pro-environmental voice, within energy-intensive organizational settings. Fourth, future research should analyse how global challenges such as climate change, energy price volatility, and environmental uncertainty shape the behavioural foundations of energy transition (Yang et al., 2022).

Fifth, greater attention should be paid to leadership and governance mechanisms that enable or constrain the influence of organizational citizenship behavior on energy-related outcomes. Sixth, studies could investigate how organizational culture and sustainability-oriented climates mediate the relationship between energy transition initiatives and employee behaviour. Seventh, cross-national and cross-industry comparative research is needed to deepen understanding of how institutional and cultural contexts influence the behavioural dynamics of energy transition, particularly between developed and emerging economies (Wang, 2021; Peng et al., 2022). Finally, longitudinal research designs would be valuable for capturing the dynamic and long-term effects of organizational citizenship behavior on energy efficiency, carbon emissions, and organizational adaptation over time.

By applying bibliometric techniques, this study maps the intellectual structure and thematic evolution of research linking organizational citizenship behavior and energy transition. Despite its reliance on the Scopus database, the analysis provides a structured basis for advancing integrated behavioural and energy economics research in energy-intensive industries.

## 5. CONCLUSION

This study was conducted to assess the state of research and to identify the main research directions at the intersection of organizational citizenship behavior and energy transition in energy-intensive industries, drawing on publications indexed in the Scopus database over the period 2015–2025. The findings reveal several core thematic directions that structure the existing literature and inform a set of future research avenues. In particular, the results highlight the importance of organizational and behavioural mechanisms in supporting energy efficiency, energy conservation, and low-carbon transition outcomes. These mechanisms include sustainability-oriented management practices, organizational capabilities, leadership and governance structures, and broader institutional and market contexts that shape discretionary employee behaviours such as organizational citizenship behavior. In light of growing sustainability pressures, accelerating digitalisation, and increasing policy and societal demands for energy transition, research linking organizational behaviour with energy-related outcomes is likely to remain a dynamic and increasingly influential area of scholarly inquiry.

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