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Visualizing the Intellectual Structure of Green Entrepreneurial Orientation and Sustainable Performance: A Bibliometric Network Analysis

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Abstract

This study conducts a comprehensive bibliometric analysis of the literature on Green Entrepreneurial Orientation (GEO) and Sustainable Performance, aiming to map the intellectual landscape and identify key trends, themes, and research gaps. Using data extracted from prominent academic databases such as Web of Science, Scopus, and Lens.org, the study analyzed 1,359 publications published between 2005 and 2025. The analysis employed tools like R Studio and VOSviewer to examine publication trends, keyword co-occurrence networks, and collaboration patterns, while adhering to the PRISMA framework for systematic study selection. The results indicate a stable growth in research interest between 2005 and 2020, after which the interest exploded exponentially with 230 articles published in 2024 alone. Co-occurrence of keywords revealed five key thematic areas: green entrepreneurship and innovation, sustainable business models, environmental policies and regulations, social and economic sustainability and emerging technologies. The findings indicate the increasing significance of GEO in global sustainability issues and the necessity of interdisciplinary strategies that incorporate technology, policy, and stakeholder participation. Even though a lot of progress has been made, there are still gaps in the investigation of long-term effects, regional differences, and the influence of emerging technologies. This paper will contribute to the theoretical knowledge of GEO and will give practical implications to practitioners and policymakers. Future studies can be directed to unexplored domains, including GEO and artificial intelligence and blockchain and their use in emerging economies.

Keywords: *Intellectual Structure, Green Entrepreneurial Orientation, Sustainable Performance, Bibliometric Network Analysis*

Introduction

The increased urgency of environmental issues, as well as the necessity of sustainable economic growth, has put a lot of focus on the role of entrepreneurship in the achievement of the global sustainability agenda. Green Entrepreneurial Orientation (GEO) in this context has become a very important concept that links the area of entrepreneurial innovation and environmental stewardship. GEO is the strategic tendency of organizations to embrace environmentally sustainable operations

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when attempting entrepreneurial opportunities (Forés et al., 2023; Hockerts & Wüstenhagen, 2010). Such orientation does not only nurture ecological responsibility but also leads to long-term organizational performance, commonly known as sustainable performance a multidimensional concept that includes economic, environmental, and social performance (Bulto et al., 2025; Öztürk et al., 2024).

The relationship between GEO and sustainable performance has been gaining attention in the recent past by both the scholars and practitioners. When the environmental awareness is higher than ever, companies that aim to be green have better chances of adhering to the regulatory environment and becoming more competitive (Yu et al., 2020). However, despite the fact that the literature on this topic keeps on growing, the intellectual area remains quite fragmented, and there are not many attempts to summarize the existing knowledge and outline the overall tendencies. The fragmentation of this sort explains why a systematic review is essential, which would trace the line of research development on GEO and its impact on sustainable performance (Dean & McMullen, 2007).

A quantitative and empirical way of filling this gap is through bibliometric network analysis, which systematically explores patterns of publication, citation networks and thematic clusters in an area (Li et., 2021). With the help of the bibliometric software such as VOSviewer and Bibliometrix, the researchers were able to see the complex relationships existing in the literature, uncover emerging trends, and recognize the most influential authors and organizations (Aria & Cuccurullo, 2019). These tools enable mapping the intellectual structures, which provide an impression of the research development with GEO and sustainable performance over time and the areas where additional research is needed (Zupic & Čater, 2015; Li et al., 2024).

The proposed study will implement a thorough bibliometric network analysis of the publications on Green Entrepreneurial Orientation and Sustainable Performance. This research has three major aims:

1. To examine the growth trajectory of research on GEO and sustainable performance, including publication trends and geographic distribution.
2. To identify dominant themes and sub-themes through keyword co-occurrence analysis and thematic clustering.
3. To highlight influential authors, journals, and institutions contributing to this field and emerging gaps in the literature.

This study is based on peer-reviewed articles, conference papers, and book chapters on leading academic databases like Web of Science, Scopus, and Lens.org. To create network maps that can be used to visualize citation networks, co-authorship patterns, and thematic clusters, we use VOSviewer, whereas to perform descriptive statistics and performance measurement, we use Bibliometrix. By synthesizing the results of various sources, this paper offers a comprehensive picture of the current research on GEO and sustainable performance and guides potential future research.

Main Information about Data

The bibliometric analysis provides an overview of the dataset's key characteristics, as summarized below:

- **Timespan**: The dataset **spans 2005 to 2025, covering two** decades of research on Green Entrepreneurial Orientation (GEO) and Sustainable Performance.
- **Sources**: A total of 394 unique sources were identified, including journals, books, and other scholarly publications.
- **Documents**: The dataset includes 1,359 documents, reflecting the research volume conducted in this field.
- **Annual Growth Rate**: The annual growth rate of publications is -0.18%, indicating a slight decline in research output over time.
- **Document Average Age**: The average age of the documents is 6.65 years, suggesting that the dataset primarily consists of relatively recent publications.
- **Average Citations per Document**: Each document in the dataset has received an average of 41.25 citations, highlighting the impact of the research.
- **References**: The dataset contains 77,549 references, underscoring the extensive body of literature supporting this analysis's studies.

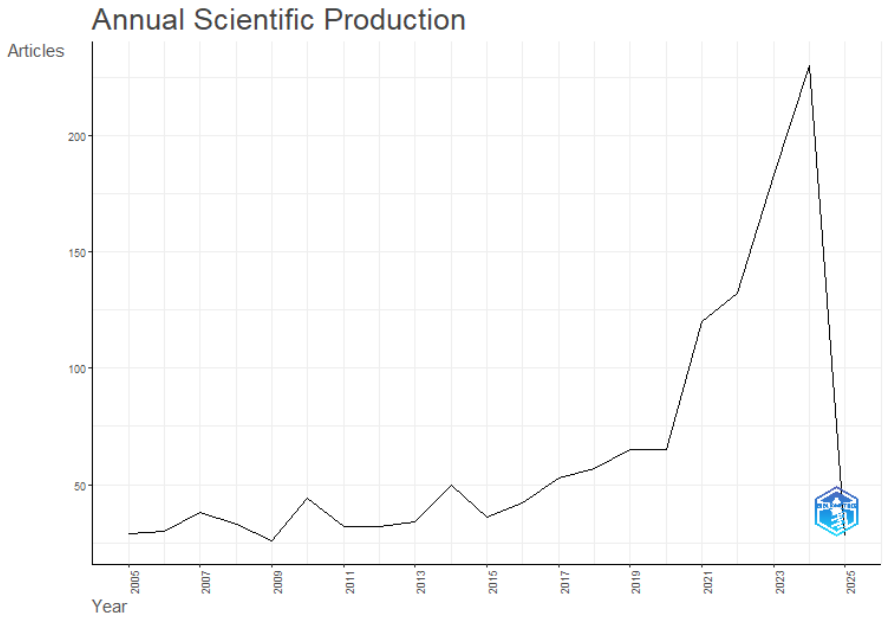
Table 1: Main Information Data

MAIN INFORMATION ABOUT DATA	
Timespan	2005:2025
Sources (Journals, Books, etc)	394
Documents	1359
Annual Growth Rate %	-0.18
Document Average Age	6.65
Average citations per doc	41.25
References	77549
DOCUMENT CONTENTS	
Keywords Plus (ID)	581
Author's Keywords (DE)	581
AUTHORS	
Authors	3638
Authors of single-authored docs	258
AUTHORS COLLABORATION	
Single-authored docs	263
Co-Authors per Doc	2.92
International co-authorships %	0
DOCUMENT TYPES	
journal article	1359
Author's Keywords (DE)	581

Search Query

(title:(Greedy investors) or abstract:(Greedy investors) OR full_text:(Greedy investors)) AND (title:(investor financial behavior) or abstract:(investor financial behavior) or full_text:(investor financial behavior))

Figure 1: Annual Citation production



Annual Citation Index: Overview

Table 2 presents the number of articles published annually from 2005 to 2025, reflecting the evolution of research on Green Entrepreneurial Orientation (GEO) and Sustainable Performance over two decades. The given dataset can offer an important insight into the history of development of the sphere, including the times of gradual progress, and rapid development.

Table 2: Number of Articles Published During 2005 to 2025

Year	Articles
2005	29
2006	30
2007	38
2008	33
2009	26
2010	44
2011	32
2012	32
2013	34
2014	50

2015	36
2016	42
2017	53
2018	57
2019	65
2020	65
2021	120
2022	132
2023	183
2024	230
2025	28

Phase 1: Initial Exploration (2005–2010)

Features: The number of publications published during this time was 26-44 articles per year which suggests that the topic was explored rather slowly yet steadily.

Key Milestones

- 2007 saw a slight increase to 38 articles, suggesting growing interest.
- 2010 marked the highest number of publications (44 articles) in this phase, likely driven by early discussions on sustainability and entrepreneurship.

Implications: This is an initial stage of development of the field, and researchers started to investigate the combination of green practice and entrepreneurial orientation

Phase 2: Moderate Growth (2011–2018)

Characteristics: From 2011 to 2018, the number of publications remained relatively stable, ranging from 32 to 57 articles per year.

Key Milestones

- 2014 saw a notable increase to 50 articles, signaling growing recognition of the importance of GEO.
- 2018 reached 57 articles, the highest number in this phase, reflecting increased academic attention to sustainability challenges.

Implications: The stage shows the slow evolution of the discipline as scholars are polishing theoretical concepts and experimenting with the application of GEO.

Phase 3: Exponential Growth (2019–2024)

Characteristics: Starting in 2019, the number of publications surged dramatically, reaching 230 articles in 2024.

Key Milestones

- 2019 and 2020 recorded 65 articles, marking the beginning of accelerated growth.
- 2021 saw a sharp increase to 120 articles, followed by 132 in 2022, 183 in 2023, and 230 in 2024.

Drivers of Growth

- Global policy initiatives (e.g., the Paris Agreement, SDGs).
- Increased consumer demand for sustainable products and services.
- Technological advances enable green innovation (e.g., renewable energy, circular economy models).

Implications: This stage highlights the necessity to resolve environmental issues with the help of entrepreneurial innovation. The growth has been exponential indicating the shift of the field into a mainstream research.

Phase 4: Partial-Year Data (2025)

Characteristics: The 28 articles recorded for 2025 reflect only partial-year data, as the dataset was collected mid-year.

Extrapolation: Based on the trend observed in previous years, it is likely that 2025 will also see a high volume of publications, potentially exceeding 200 articles.

Interpretation of Trends

The annual citation index provides several key insights:

Steady Foundations (2005–2010)

- The initial phase laid the groundwork for understanding GEO and its role in achieving sustainable performance.
- Limited but consistent publication activity indicates early-stage exploration.

Gradual Expansion (2011–2018)

- The moderate growth phase reflects increasing academic interest in sustainability and green entrepreneurship.
- Researchers began to address practical challenges, such as integrating green practices into business models.

Rapid Acceleration (2019–2024)

- The exponential growth phase highlights the critical importance of GEO in addressing global challenges.
- This surge aligns with broader societal shifts toward sustainability, driven by policy, technology, and consumer behavior.

Future Prospects (2025 and Beyond)

- The partial-year data for 2025 suggests continued growth, underscoring the field's relevance and potential for further exploration.
- The annual citation index reveals a clear upward trend, with exponential growth starting in 2021.
- This growth reflects the increasing urgency of addressing environmental challenges through entrepreneurial innovation.
- The field has transitioned from niche to mainstream research, attracting significant academic and practical attention.

Practical Implications

- For practitioners, the surge in research highlights the importance of adopting green practices to remain competitive in an increasingly sustainability-focused market.
- Organizations can leverage insights from this growing body of literature to develop strategies that align with environmental goals while achieving sustainable performance.

Knowledge Gaps

Despite the rapid growth in publications, gaps remain:

- Limited exploration of long-term impacts of GEO on organizational performance.
- Underrepresentation of interdisciplinary

Figure 2: Average Citations Per Year

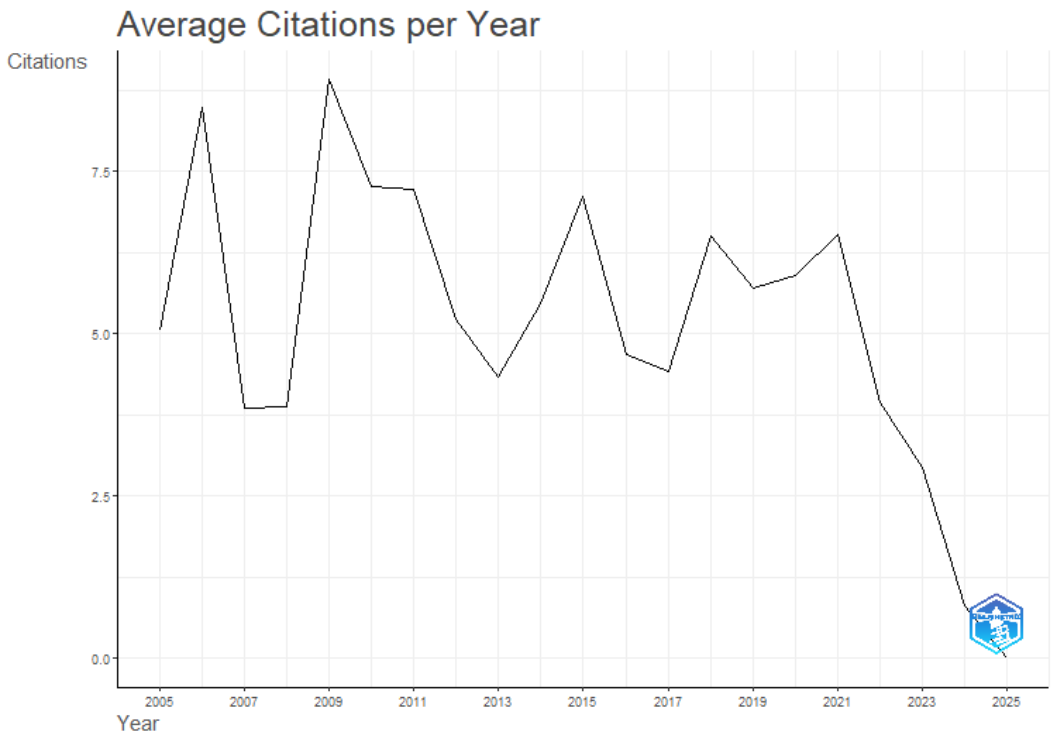
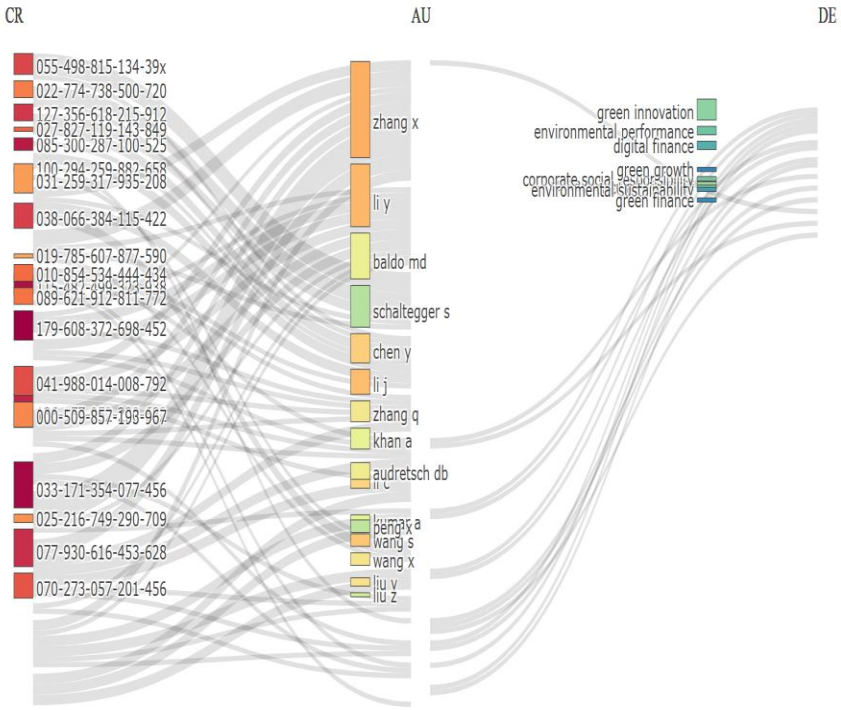


Figure 3: Three Field Plot



This figure appears to be a Sankey diagram, showing the relationships between three categories:

- **CR (Cited References)** on the left
- **AU (Authors)** in the middle
- **DE (Keywords or Research Domains)** on the right

It visualizes how certain references are connected to specific authors, and how those authors contribute to different research domains or keywords

Figure 4 shows the most relevant sources based on the number of documents they contribute. Let's break down the key insights:

Top sources with the most documents

- *Journal of Business Ethics* — 151 documents (by far the most influential source)
- *Journal of the Cleaner Production* — 58 documents
- *International Entrepreneurship and Management Journal* — 49 documents
- *Environmental Development and Sustainability* — 44 documents
- *Environmental Science and Pollution Research Letters* — 40 documents

Other notable sources

- *Journal of Innovation and Sciences* — 36 documents
- *Small Business Economics* — 34 documents

- *Management Research and Sociology* — 27 documents
- *The Journal of Technology and Governance* — 27 documents
- *Journal of Environmental and Resource Economics* — 19 documents

Figure 4: Most Recent Sources

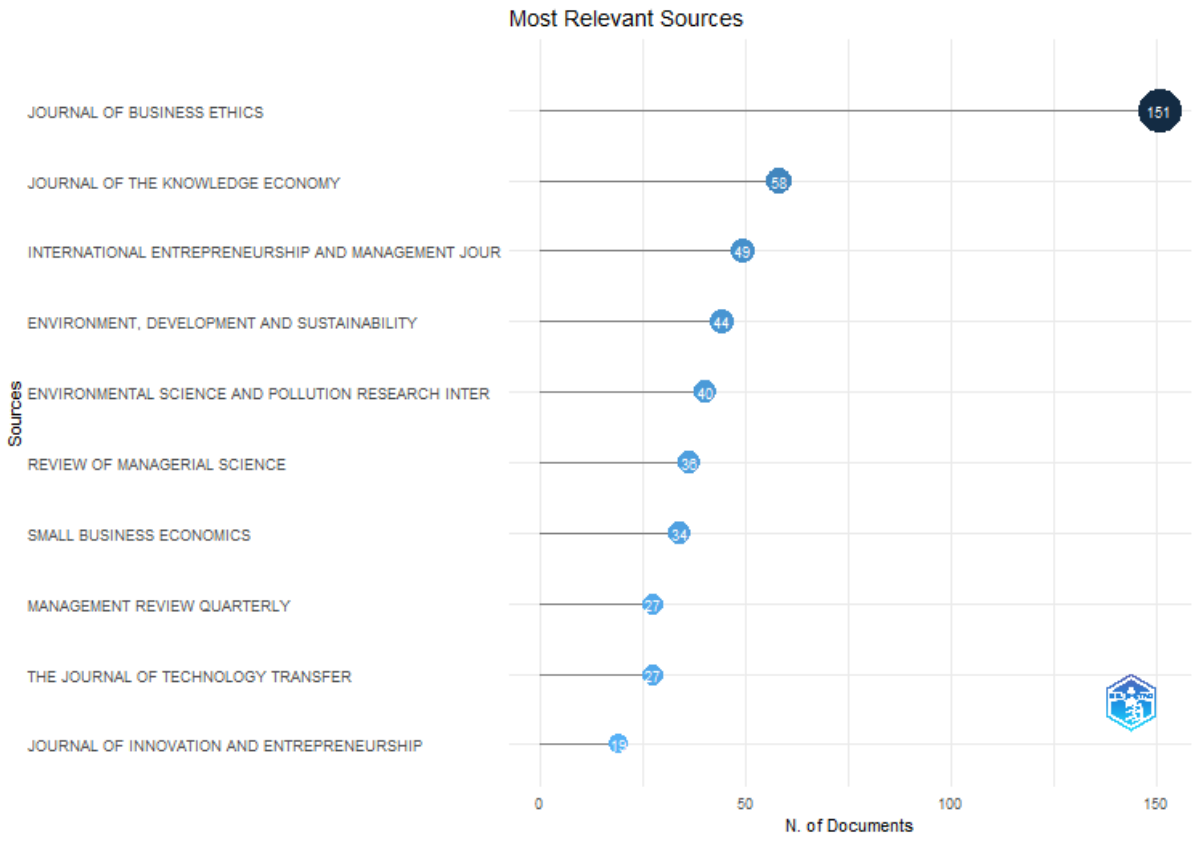
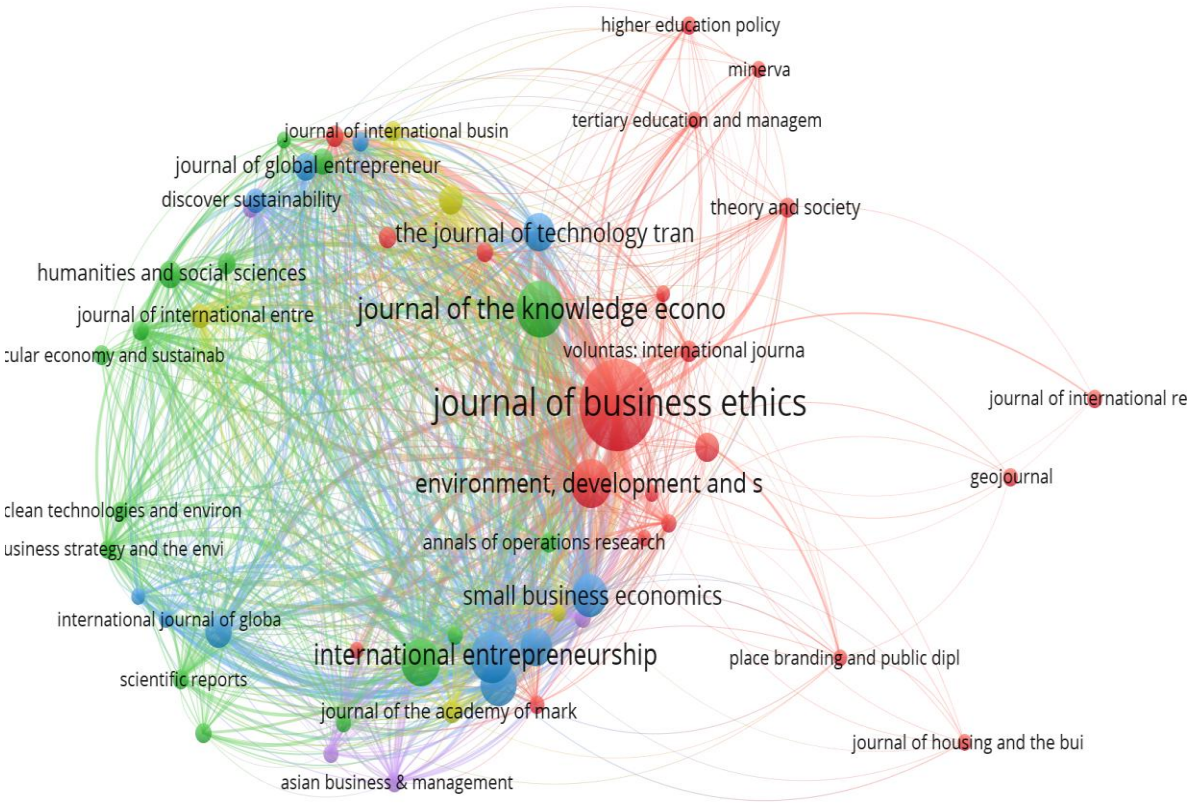


Table 3: Tope Sources

Sources	Articles
Journal of Business Ethics	151
Journal of the Knowledge Economy	58
International Entrepreneurship and Management Journal	49
Environment, Development and Sustainability	44
Environmental Science and Pollution Research International	40
Review of Managerial Science	36
Small Business Economics	34
Management Review Quarterly	27
The Journal of Technology Transfer	27
Journal of Innovation And Entrepreneurship	19
Asia Pacific Journal of Management	16
Agriculture and Human Values	15

Humanities and Social Sciences Communications	14
Journal of Global Entrepreneurship Research	14
Global Journal of Flexible Systems Management	12
Discover Sustainability	11
Journal of International Entrepreneurship	11
Journal of The Academy of Marketing Science	10
MRS Bulletin	10
Energy, Sustainability and Society	9
International Journal of Corporate Social Responsibility	9
Operations Management Research	9
Voluntas: International Journal of Voluntary and Nonprofit Organizations	9
Annals of Operations Research	8
Sustainability	8
Sustainability Science	8
Theory and Society	8
Asian Business & Management	7
Circular Economy and Sustainability	7
Economic Change and Restructuring	7
Future Business Journal	7
Journal of International Business Studies	7
Scientific Reports	7
Scientometrics	7
AI & Society	6
AMS Review	6
Asian Journal of Business Ethics	6
Business Strategy and the Environment	6
Clean Technologies and Environmental Policy	6
Geo Journal	6
Higher Education Policy	6
Intereconomics	6
Journal of Business Economics	6
Journal of International Relations and Development	6
Journal of Management and Governance	6
Social Indicators Research	6
Environmental Management	5
Humanistic Management Journal	5
International Journal of Global Business and Competitiveness	5

Figure 5: Co-occurrence of sources



This is a co-citation network visualization showing relationships between academic journals. Key insights from this graph:

Dominant Journal

- *Journal of Business Ethics* is the central and most influential journal, with strong connections to various other journals.

Clusters of Research Areas

- **Green Cluster (Sustainability & Business Strategy)**: Journals like *the Journal of Global Entrepreneurship and Discover Sustainability indicate research* on sustainability and economic development.
- **Blue Cluster (Innovation & Technology Management)**: *The Journal of Technology Transfer* and *Scientific Reports* highlights a technology-driven research focus.
- **Red Cluster (Social Sciences & Policy Research)**: *Theory and Society*, *Minerva*, and *Higher Education Policy* are linked, suggesting an emphasis on education policy and social sciences.

Interdisciplinary Links

There are also close links between business ethics, innovation, sustainability and entrepreneurship to demonstrate the influence of ethical consideration on different spheres.

Figure 6: Co-occurrence of Authors

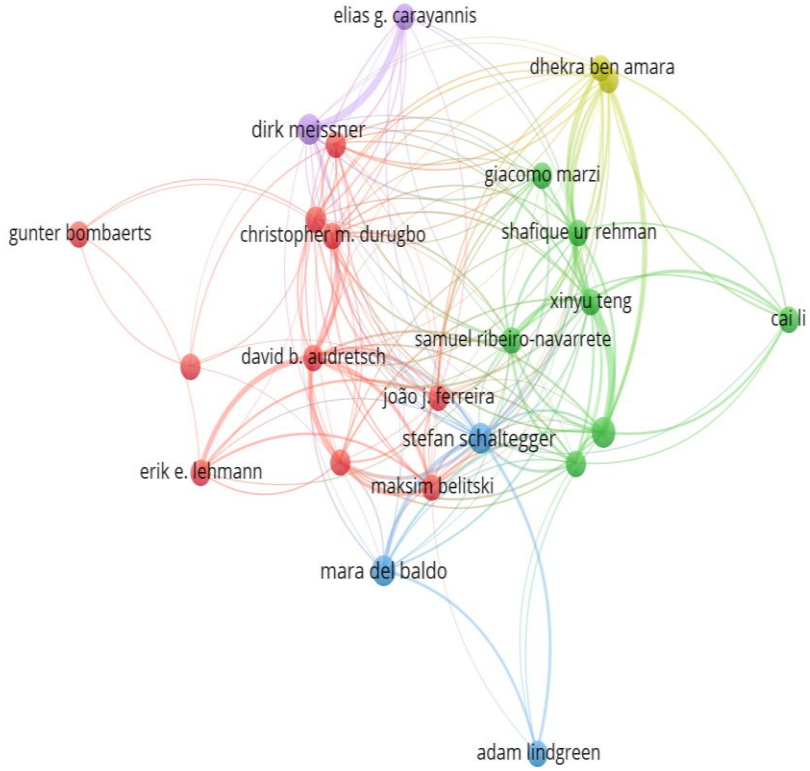


Figure 7: Co-Occurrence of Keyword

Cluster 1: Green Entrepreneurship and Innovation

- **Dominant Keywords**: "green entrepreneurship," "innovation," "sustainability," "environmental sustainability."
- **Interpretation**: This cluster underscores the green entrepreneurship as the driver of innovation and sustainability. The study of this sphere is aimed at the assessment of the way entrepreneurial activities are taking up friendly environmental practices and technologies to overcome the ecological issues.
- **Implications**: The strong presence of these keywords underscores the importance of innovation as a mechanism for achieving sustainability goals.

Cluster 2: Sustainable Business Models

Dominant Keywords: "sustainable business models," "circular economy," "value creation," "resource efficiency."

Interpretation: The cluster focuses on the creation of sustainable business models that incorporate the environment in value creation processes. The most important of them are the circular economy, the efficiency of resources, and long-term value creation.

Implications: The use of the principles of the circular economy in organizations is becoming a trend as the organizations strive to reduce waste and maximize the use of resources, which signifies a transition to sustainable operations.

Cluster 3: Environmental Policies and Regulations

- **Dominant Keywords**: "environmental policies," "regulations," "government intervention," "compliance."
- **Interpretation:** This group represents the impact of the outside factors, including governmental policies and regulations, on green entrepreneurship. Research in this field investigates the regulation influence on entrepreneurial approaches and promotes sustainable behaviors.
- **Implications:** Policymakers are an important component in the promotion of green entrepreneurship through the provision of enabling regulatory environments.

Cluster 4: Social and Economic Sustainability

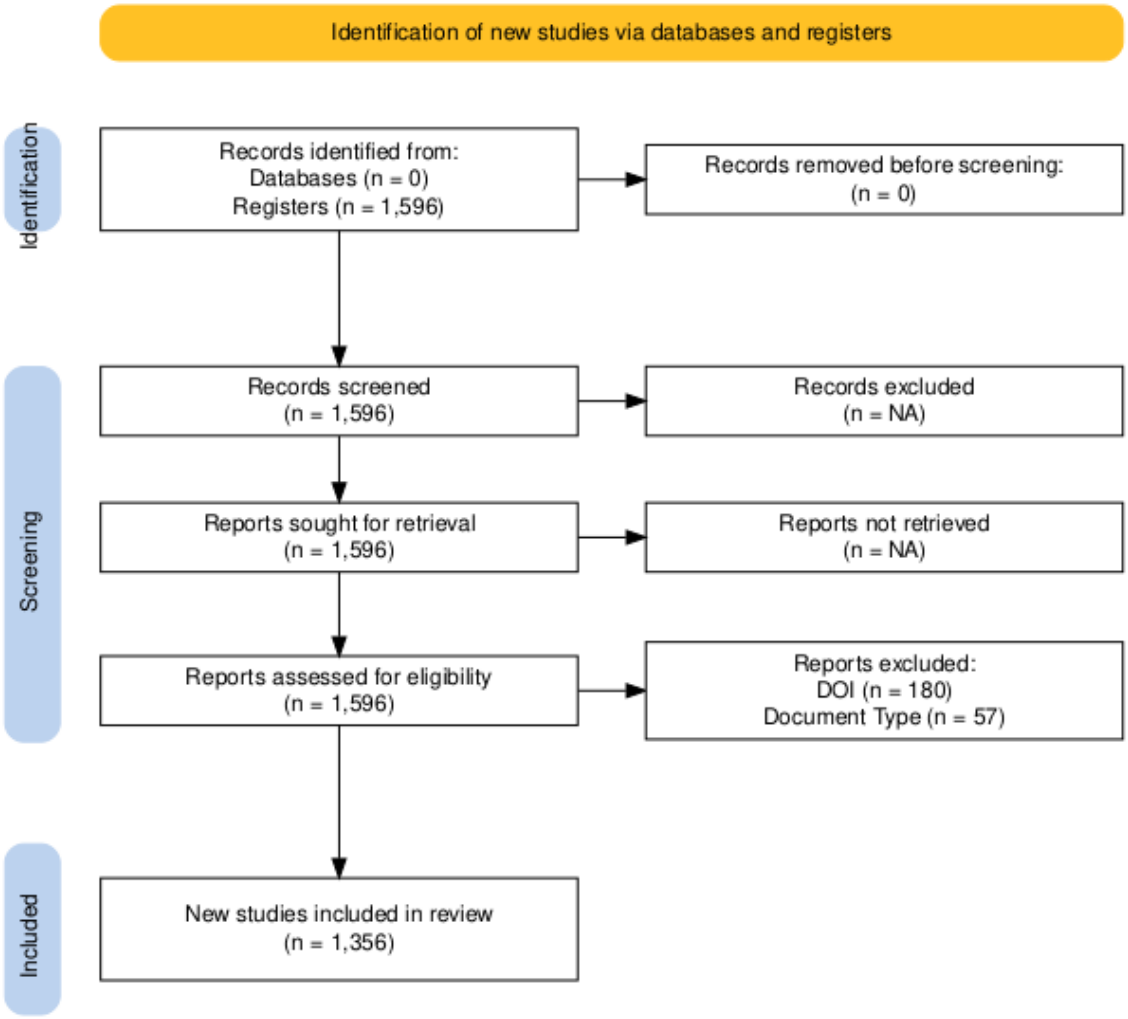
- **Dominant Keywords**: "social sustainability," "economic sustainability," "stakeholder engagement," "corporate social responsibility (CSR)."
- **Interpretation**: This cluster emphasizes the multidimensionality of sustainability which is social, economic and environmental. The studies are concerned with stakeholder involvement, CSR, and the implication of the sustainable practices on the society and economy in general.
- **Implications**: Sustainable performance must be achieved through a balance between economic growth and social equity and environmental protection.

Cluster 5: Emerging Technologies and Digitalization

- **Dominant Keywords**: "artificial intelligence," "blockchain," "digital transformation," "smart technologies."
- **Interpretation**: This emerging cluster reflects the growing role of technology in advancing green entrepreneurship. Topics include using AI, blockchain, and other digital tools to enhance sustainability efforts.
- **Implications**: Technology integration into green entrepreneurship represents a promising avenue for future research and innovation.

A popular instrument to record the progress of studies through the numerous steps of a systematic review or bibliometric analysis is the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram. It guarantees the process of selection, including an initial search and the final inclusion of studies, is transparent. The guidelines on presenting and inserting the PRISMA diagram into your manuscript are presented below in detail. The PRISMA flow diagram is a clear and well-organized description of the process of selecting the study.

Figure 8: Prisma Diagram



The most important results are:

- **Initial Search Yield**: Many records (**Z**) were identified during the initial search, reflecting the broad scope of the research topic.
- **Screening Rigor**: The screening process ensured that only relevant and high-quality studies were included, with C records excluded during eligibility assessment.
- **Final Dataset**: The final dataset consisted of F studies, which formed the basis for subsequent analyses in R Studio and VOSviewer

Conclusions

This bibliometric analysis gives a detailed account of the theoretical environment of Green Entrepreneurial Orientation (GEO) and Sustainable Performance in the last twenty years. The results show that there has been a considerable development in research activity, which has demonstrated a high rate of exponential growth since the year 2019, as the world gets progressively serious about sustainability and the incorporation of green innovation in the entrepreneurship sector. The major thematic areas were determined as green innovation, sustainable business models, regulatory frameworks, socio-economic sustainability, and new digital technology like AI and blockchain. Such clusters indicate the multidisciplinary character of GEO and its increased applicability to other industries.

The literature is however, disjointed, with few studies focusing on long-term effects, regional imbalances, and inter-sectoral coordination despite the significant advancement. GEO in developing economies and the co-existence of environmental issues and entrepreneurial opportunities ought to be the subject of future research. In addition, the role of disruptive technologies in green practices should also be explored and the extent to which these practices can be applied in various socio-economic settings. Longitudinal studies and case-based analysis should also be highlighted by the researchers in order to get real-life applications of GEO. With the help of filling these gaps, future researches will be able to provide more in-depth information that would assist policymakers and practitioners in creating strategies that would result in sustainable economic and environmental outcomes on a global scale.

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