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SMALL STEPS, BIG IMPACT: A BIBLIOMETRIC PERSPECTIVE OF SUSTAINABILITY IN MICRO, SMALL AND MEDIUM ENTERPRISES

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Abstract

Purpose: This study investigates the evolution, structural composition, and current trends in scholarly literature concerning sustainability within Micro, Small, and Medium Enterprises (MSMEs). Considering their vital role in inclusive economic development, a bibliometric analysis is conducted to synthesize existing knowledge and delineate future research directions. **Design/Methodology:** The study was conducted based on 351 documents indexed in Scopus from 2012 to 2025. Advanced bibliometric and science mapping techniques, utilising VOSviewer and R Studio, were employed. The analysis encompassed the examination of publication trends, authorship and collaboration patterns, citation impact, and keyword co-occurrence. **Findings:** The results demonstrate a significant increase in research on MSME sustainability since 2015, characterised by fragmented scholarly communities and limited international collaboration. Key authors, sources, and countries- namely Indonesia, India, Malaysia, and the United Kingdom- were identified. Co-occurrence mapping underscores well-established themes and emerging areas of interest, particularly the connection between sustainability and MSME resilience. **Originality:** This pioneering study offers a comprehensive synthesis of MSME sustainability research, providing valuable insights for scholars, practitioners, and policymakers.

Keywords: ESG, MSME, Micro, Small and Medium Enterprises, Sustainability, Systematic Literature Review, Bibliometric Analysis.

1. INTRODUCTION

Sustainability has transitioned from a supplementary issue to a primary cornerstone of international policy and corporate strategy (Behl *et al.*, 2022). Challenges such as climate change (Khurana *et al.*, 2021), resource exhaustion (Ashton *et al.*, 2018), and increasing inequalities (Virmani *et al.,* 2021) necessitate immediate intervention. The United Nations' 2030 Agenda advocates for inclusive and environmentally sustainable growth, thereby obligating enterprises globally to incorporate sustainability principles into their fundamental operations. Micro, Small, and Medium Enterprises (MSMEs) are vital to this transition. They constitute over 90% of enterprises and account for more than half of global employment.

In emerging economies, they facilitate local development and promote social inclusion. However, their fragmented structures, limited resources, and inadequate sustainability reporting render them both indispensable drivers of change and highly susceptible to vulnerabilities. In India, more than 63 million MSMEs operate; nevertheless, only a marginal portion are engaged in sustainable practices, despite their substantial environmental and social impact (Ministry of MSME, 2023).

Research concerning the sustainability of Micro, Small, and Medium Enterprises (msmes) remains limited and fragmented. The majority of existing studies focus on large corporations, supply chains, or broad sectoral transformations, thereby insufficiently addressing issues specific to MSMES. Notably, there are persistent gaps in understanding the field's development, including the identification of leading contributors, prevailing themes, and areas where knowledge is deficient.

Although works such as Mondal and Gupta (2024), Pandya *et al.* (2024), and Kumar *et al.* (2024) offer valuable insights, they lack comprehensive bibliometric analysis, chronological mapping, and network analysis.

This study addresses these gaps through a comprehensive bibliometric and scientometric analysis of sustainability research pertaining to MSMEs from 2012 to 2025, utilising data from Scopus. It integrates performance metrics- such as publication trends, citation counts, authorship, and journal impact- with science mapping techniques, including co-authorship, citation, co-citation, and keyword co-occurrence analyses. The examination considers both structural and temporal dimensions, revealing thematic clusters, collaboration networks, and emerging research frontiers. The four research questions are

1. How has the annual volume of publications on MSME sustainability evolved over the study period, and what patterns emerge from authorship productivity in accordance with Lotka's Law?
2. Who are the leading authors in this domain, and in what ways do international co-authorship patterns, especially at the country level influence the structure of the research landscape?
3. Which countries, institutions, and journals demonstrate the highest citation impact, and what are the most frequently cited documents contributing to this influence field?
4. What thematic clusters and research trends emerge from keyword co-occurrence analyses utilising network, overlay, and density visualizations?

By consolidating fragmented literature and systematically analysing its intellectual framework, this study offers a comprehensive roadmap for future research, policy development, and practical application. The findings are intended to enhance the role of MSMEs as proactive agents in fostering a more sustainable and equitable global economy.

2. METHODOLOGY

2.1 Identification of Keywords and Selection Criteria:

The systematic literature review (SLR) methodology was followed to understand prior research thoroughly and highlight pertinent findings (Moustaghfir, 2008). A total of 351 documents published in Scopus over the past decade, i.e. from the year 2012 till April 20, 2025, were downloaded using the keywords "Sustainab*" OR "ESG" OR "CSR" OR "Environmental, Social and Governance" OR "Green" AND "Practices" OR "Methods" OR "Techniques" OR "Approaches" OR "Procedures" AND "MSME" OR "MSMEs" OR "Micro, Small, and Medium Enterprises". 351 studies were finally accepted for further processing for bibliometric review as per the criteria specified in Table I.

Table I: Inclusion/ Exclusion Criteria

	Inclusion	Exclusion
Document type	Articles (388)	Book chapters (48); Review (26); Conference paper (128); Note (2); Book (5); Retracted (1); letter (1)
Language	English (381)	Russian (1), Spanish (5), Indonesia (1)
Publication stage	Final (351)	Articles in press (25)

(Source: Author representation)

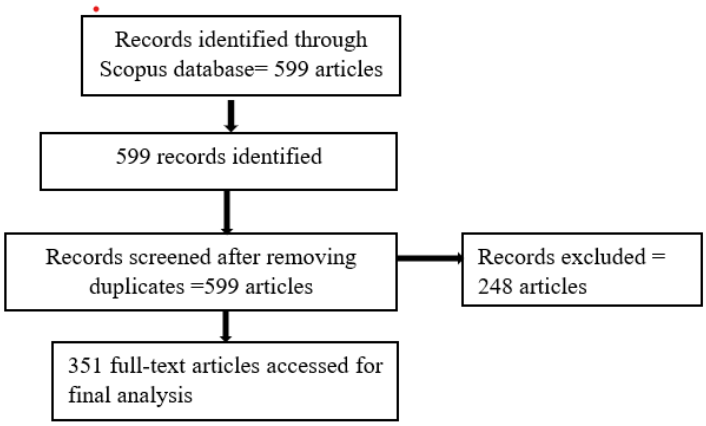


Figure 1: PRISMA Chart

Note(s): For relevant literature up to April 20, 2025
Source(s): Adapted from (Moher et al., 2009).

3. FINDINGS

3.1 Subject-wise analysis:

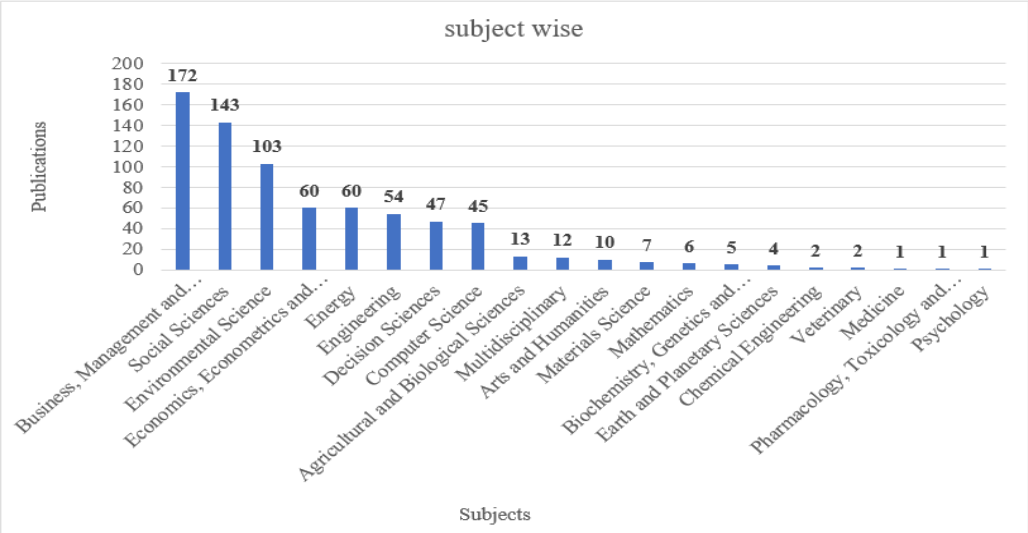


Figure 2: Subject-wise Publications

Source: Authors' representation

Figure 2 depicts the distribution of 351 documents indexed in Scopus, categorised according to subject matter. The research predominantly exhibits a multidisciplinary nature, with the largest proportions observed in Business, Management, and Accounting (172), Social Sciences (143), and Environmental Science (103). Furthermore, Economics, Finance, and Energy each constitute 60 papers, whereas Engineering (54), Decision Sciences (47), and Computer Science (45) represent disciplines rooted in technology and analytical approaches. Lesser contributions are derived from Agricultural Sciences (13), Arts and Humanities (10), Materials Science (7), Mathematics (6), and other fields. This distribution emphasises a primary focus on business, social, and environmental domains, thereby highlighting opportunities for further interdisciplinary collaboration to enhance MSME sustainability.

3.2 Information about annual publications:

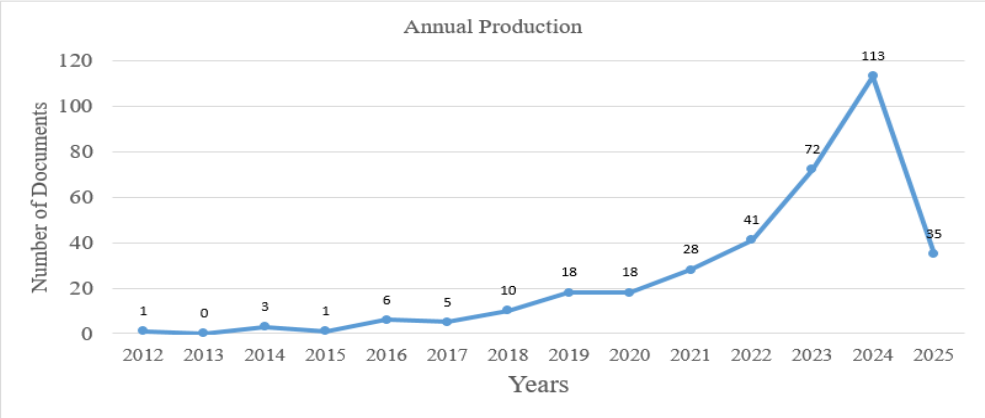


Figure 3: Annual Production of Documents

Source(s): Authors' representation

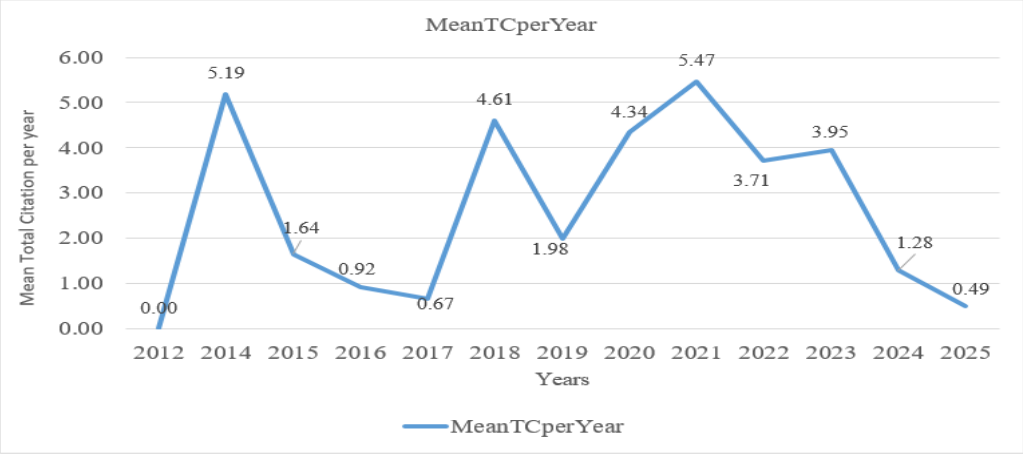


Figure 4: Mean citation per year

Source: Authors' representation

Figure 3 illustrates the annual distribution of 351 publications concerning MSME sustainability from 2012 to 2025, demonstrating steady growth following an initial minimal output of a single article in 2012. The number of publications increased to ten in 2018, eighteen in 2020, and twenty-eight in 2021, subsequently experiencing a significant rise to forty-one in 2022 and reaching a peak of one hundred thirteen in 2024.

This trend is presumably influenced by global policy developments, funding opportunities, and Sustainable Development Goal (SDG) initiatives. The 2025 figure (35 articles) reflects incomplete data rather than a genuine decline. Figure 4 depicts the Mean Total Citations per Year, revealing that despite lower publication outputs, 2014 (5.19 citations) and 2021 (5.47 citations) exhibited the highest average citations, indicating sustained influence. Years such as 2018 (4.61 citations) and 2020 (4.34 citations) also demonstrated substantial impact. Lower averages observed in 2023 (3.95) and 2024 (1.28) are attributable to citation lag, with 2025 recording the lowest (0.49) due to recency. Overall, the volume of publications has increased markedly since 2018, with several years contributing influential works that have significantly shaped the development of the field.

3.4 Authorship Analysis

a) Lotka's Law (R)

Table II: Frequency distribution of authors by number of publications

Documents written	N. of Authors
1	1065
2	59
3	12
4	8
5	3
7	1

(Source: Author representation)

Author productivity in this study adheres to Lotka's Law, which posits that the number of authors producing "n" papers is inversely proportional to n^2. As shown in Table II, 1,065 authors have a single publication, whereas significantly fewer have multiple outputs: 59 with two papers, 12 with three, 8 with four, 3 with five, and only one with seven. The more pronounced decline than predicted confirms a highly unequal distribution, wherein a small subgroup of prolific authors generates the majority of publications. This long-tail pattern represents a fragmented authorship base, characterised by numerous transient contributors and a limited core of influential researchers.

b) Most relevant authors in terms of the number of publications:

Table III: Most relevant authors

Authors	Articles
Singh S	7
Muafi M	5
Soewarno N	5
Tjahjadi B	5
Gupta H	4
Haleem A	4
Khurana S	4
Kumar R	4
Mannan B	4
Mondal S	4

(Source: Author representation)

Table III illustrates the leading authors in MSME sustainability research. Singh, S., ranks first with seven publications, reflecting substantial influence in the field. Muafi, M., Soewarno, N., and Tjahjadi, B. follow with five publications each, suggesting possible collaborative networks shaped by institutional or regional proximity. A secondary group—Gupta, H., Mannan, B., Haleem, A., Khurana, S., Kumar, R., and Mondal, S.—each contribute four publications, representing an active cohort advancing thematic development. Collectively, these authors constitute the core intellectual group within this research domain, fostering scholarly consistency and promoting collaborative opportunities.

c) Author local impact (top-cited authors:

This study evaluates author influence in MSME sustainability research through bibliometric indicators such as the H-index, G-index, M-index, total citations (TC), publication count (NP), and start year. Prakash, A. (TC = 215 since 2014) and Roy, M. (TC = 204 since 2016) demonstrate sustained impact with stable indices over time.

Table IV: Top-cited authors

Author	H_Index	G_Index	M_Index	TC	NP	PY_Start
Prakash A	3	3	0.25	215	3	2014
Roy M	3	3	0.3	204	3	2016
Singh M	3	3	0.3	204	3	2016
Singh S	6	7	2	201	7	2023
Haleem A	4	4	0.571	196	4	2019
Khurana S	4	4	0.571	196	4	2019
Mannan B	4	4	0.571	196	4	2019
Chakraborty A	3	3	0.3	194	3	2016
Mohanty R	2	2	0.167	184	2	2014
Brito H	1	1	0.333	169	1	2023

(Source: Author representation)

Singh, S., active since 2023, has the highest H-index (6), G-index (7), and M-index (2) among seven publications, indicating rapid early influence. Haleem, A., Khurana, S., and Mannan, B. share the same metrics (H = 4, G = 4, M = 0.571, TC = 196), with consistent collaboration since 2019. Chakraborty, A. (TC = 194) and Singh, M.P. (TC = 204), both publishing since 2016, exhibit steady productivity. Despite fewer outputs, Brito, H. (TC = 169) and Mohanty, R. (TC = 184) attain high citation rates, reflecting substantial influence from limited publications. Overall, these patterns emphasise a blend of established scholars with long-term impact and emerging researchers rapidly gaining recognition within the field of sustainability in MSMES.

3.5 Co-Authorship Analysis

a) *Countries:*

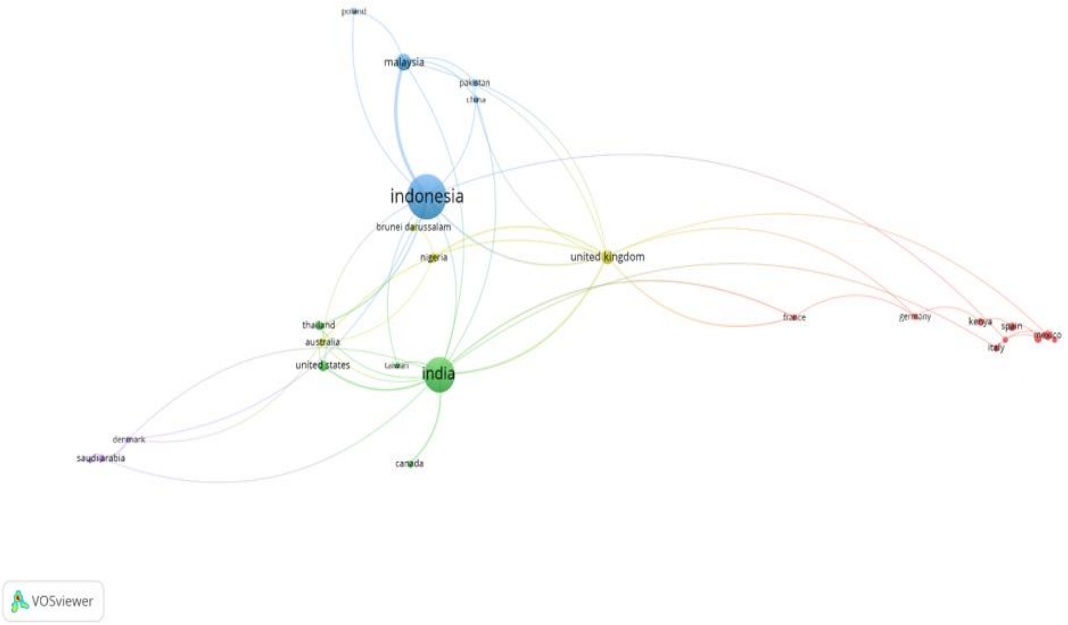


Figure 5: Co-authorship country analysis

Source: Authors' representation

Figure 5, generated using VOSviewer, illustrates the co-authorship network within MSME sustainability research, revealing distinct regional and thematic groupings. Indonesia, represented by a prominent blue cluster, demonstrates robust local collaboration with Malaysia,

Pakistan, and other Southeast Asian nations, signifying regional cooperation. India, depicted as a green cluster, maintains extensive connections with the United States, the United Kingdom, Canada, and Nigeria, establishing itself as a global hub for scholarly collaboration. European nations—namely Germany, Italy, Spain, and France—compose a unified cluster, with the United Kingdom serving as an intermediary for cross-regional knowledge exchange.

The density of the network underscores the strength of international partnerships, emphasising the global and multidisciplinary nature of MSME sustainability research and highlighting the necessity for enhanced transnational cooperation to promote innovation and sustainable development.

3.6 Citation Analysis

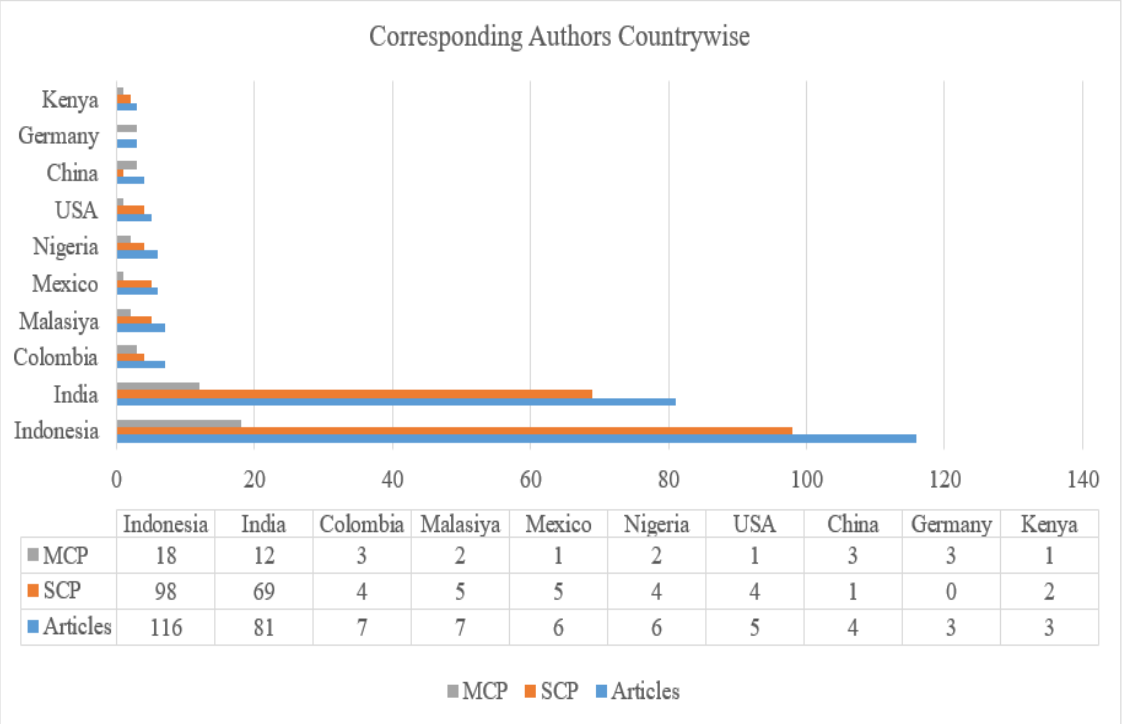
a) Countries:

Figure 6: Country citation analysis

Source: Authors' representation

Figure 6, generated using VOSviewer, delineates the global citation network pertinent to MSME sustainability research, emphasising the distribution and interconnection of scholarly influence. Node size and positioning denote citation counts and bibliometric relationships. Indonesia emerges as the central node, signifying a substantial influence, likely attributable to its extensive MSME sector and commitment to sustainable development. India and Malaysia form a proximate regional cluster alongside Indonesia, underscoring the significance of Southeast and South Asia. Furthermore, India serves as a conduit between the Global South and Western nations such as the United States, the United Kingdom, and Canada, facilitating cross-regional knowledge exchange. Countries including France, Italy, Denmark, Brazil, and Australia exhibit comparatively lower citation influence, indicating emerging or less active involvement. Overall, the analysis reveals a research landscape predominantly concentrated in specific regions, dominated by a few principal contributors, with opportunities for enhanced international collaboration to promote more inclusive sustainability research.

b) Corresponding Authors' Countries:



	Indonesia	India	Colombia	Malasiya	Mexico	Nigeria	USA	China	Germany	Kenya
MCP	18	12	3	2	1	2	1	3	3	1
SCP	98	69	4	5	5	4	4	1	0	2
Articles	116	81	7	7	6	6	5	4	3	3

Figure 7a: Corresponding Authors' Country-wise

Source: Author's representation

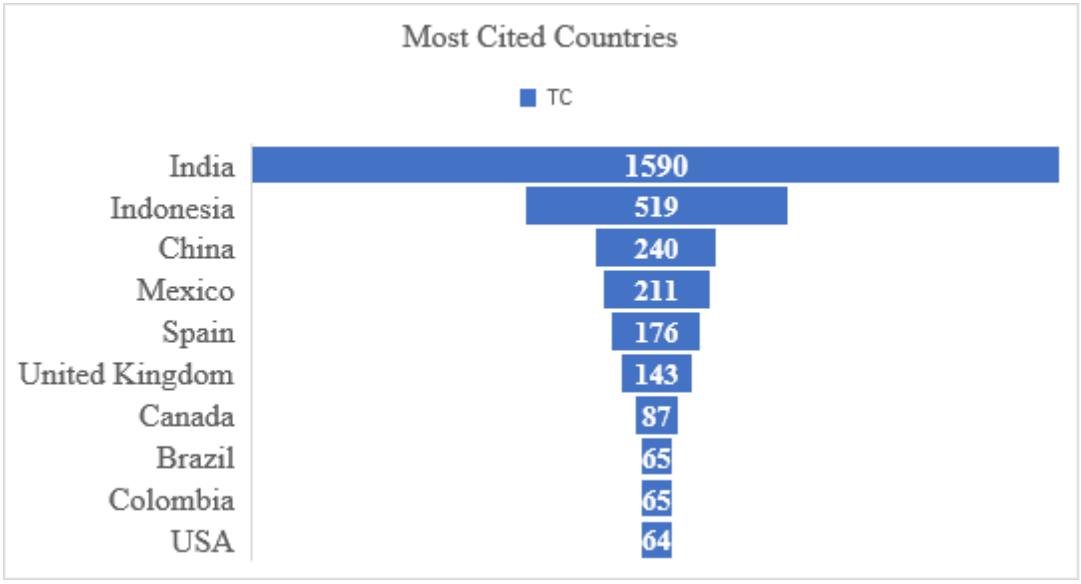


Figure 7b: Most Cited Countries

Source: Authors' representation

The analysis of publication outputs and total citations (TC) by country reveals patterns of productivity and impact in MSME sustainability research. Indonesia ranks highest with 116 publications, followed by India with 81; however, India's total citations reach 1,590, significantly surpassing Indonesia's 519. This disparity indicates a higher citation efficiency and scholarly influence for Indian publications. Both nations predominantly publish

domestically, with Indonesia producing 18 multi-country publications (MCPs) and 98 single-country publications (SCPs), while India has 12 MCPs and 69 SCPs, reflecting limited international collaboration. Colombia, Malaysia, and Mexico contribute modestly to the research output; however, Colombia and Malaysia exhibit higher MCP ratios, signifying stronger cross-border engagement. China has produced only four publications but has accumulated 240 citations, whilst Mexico's six publications have garnered 211 citations—both indicating high-impact contributions. Countries such as Spain, the United Kingdom, Canada, Brazil, Colombia, and the United States, despite producing fewer publications, demonstrate considerable influence through elevated citation rates, often attributable to collaborative and high-quality research efforts. Conversely, Germany and Kenya, with fewer MCPs, are absent from the top citation rankings, potentially due to lower visibility or recent entry into the field. The findings highlight a discrepancy between the volume of publications and their citation impact, emphasising the significance of international collaboration in augmenting visibility and influence. The considerable proportion of SCP among leading nations reflects substantial untapped potential for global partnerships. Although the research demonstrates geographic diversity, it remains predominantly driven by citations, with India, China, and Mexico emerging as principal contributors. This indicates opportunities for intensified international cooperation to further the advancement of MSME sustainability research.

c) Most cited documents:

Table V: Highly cited documents

Author And Sources	DOI	Total Citation	TC per Year
Singh M, 2018, Resource Conservation and Recycling	10.1016/j.resconrec.2017.07.015	171	21.38
Martínez-Peláez R, 2023, Sustainability	10.3390/su151411221	169	56.33
Sánchez-Infante Hernández J, 2020, Technological Forecast Social Change	10.1016/j.techfore.2019.119774	150	25.00
Mohanty R, 2014, Production Planning and Control	10.1080/09537287.2013.832822	145	12.08
Khanzode A, 2021, Journal of Cleaner Production	10.1016/j.jclepro.2020.123489	142	28.40
Singh M, 2021, Journal of Cleaner Production	10.1016/j.jclepro.2020.123592	131	26.20
Behl A, 2022, Journal of Business Research	10.1016/j.jbusres.2022.05.009	124	31.00
Achi A, 2022, Journal of Business Research	10.1016/j.jbusres.2021.10.016	115	28.75
Chaurasia S, 2020, Journal of Knowledge Management	10.1108/JKM-04-2020-0319	87	14.50
Khurana S, 2021, Journal of Cleaner Production	10.1016/j.jclepro.2020.125377	78	15.60

(Source: Author representation)

The scholarly discourse on sustainability within MSMEs is continually expanding, offering insights across theoretical frameworks, research methodologies, and management practices conducive to sustainable transformation. Singh *et al.* (2018) enhances the Theory of Planned Behavior by incorporating environmental commitment alongside green economic incentives, thereby illustrating their impact on MSMEs' readiness for the circular economy and observing the limited influence of perceived behavioral control. Martínez-Peláez *et al.* (2023) conducts a review of digital sustainability, emphasising the importance of Big Data Analytics, cultural

transformation, and stakeholder engagement as pivotal elements. Achi *et al.* (2022) establishes a positive correlation between corporate social responsibility (CSR) and economic performance, with firm size functioning as a moderating variable. Mohanty and Prakash (2014) highlights that external stimuli from stakeholders and regulatory authorities, coupled with internal initiatives such as workforce training, foster the advancement of green supply chains practices. Khanzode (2021) employs DEMATEL method to assess barriers to the adoption of Industry 4.0, emphasising technological obsolescence and policy deficiencies, and advocates for systemic reforms. Singh *et al.,* (2021) underscores Environmental Lean Six Sigma (LSS) for Indian MSMEs, concentrating on strategic and environmental determinants. Behl *et al.* (2022) proposes a model linking Big Data Capabilities to competitive advantage, mediated by supply chain trust and coordination, grounded in Organizational and Institutional theories. Achi *et al.* (2022) concludes that CSR-driven green innovation enhances MSME performance amidst environmental volatility, utilising a moderated mediation framework. Chaurasia *et al.,* (2020) emphasises knowledge-sharing, openness, and co-creation as fundamental for open innovation, requiring integrated approaches. Khurana *et al.* (2021) applies the Analytic Hierarchy Process (AHP) to prioritise factors such as policy support and technological adaptation for fostering sustainable-oriented innovation, particularly in resource-constrained contexts. Collectively, these studies furnish a comprehensive framework that enhances the understanding of the behavioural, structural, technological, and institutional factors affecting sustainability in MSMEs, thereby offering valuable evidence to guide policy formulation and strategic decision-making.

d) Source Local Impact:

Table VI: Source local impact

Source	h-index	g-index	m-index	TC	NP	PY_start
Journal of Cleaner Production	12	14	1.2	740	14	2016
Sustainability (Switzerland)	9	18	1.286	409	18	2019
Benchmarking	7	8	0.875	252	8	2018
Journal of Business Research	2	2	0.5	239	2	2022
Resources, Conservation and Recycling	1	1	0.125	171	1	2018
Technological Forecasting and Social Change	1	1	0.167	150	1	2020
Production Planning and Control	1	1	0.083	145	1	2014
TQM Journal	5	6	1	110	6	2021
Journal of Knowledge Management	1	1	0.167	87	1	2020
Environmental Technology and Innovation	1	1	0.125	63	1	2018

(Source: Author representation)

The bibliometric analysis emphasises the Journal of Cleaner Production as the leading journal for research on sustainability within Micro, Small, and Medium Enterprises (MSME). It possesses an h-index of 12, a g-index of 14, and has garnered 740 citations across 14 publications since 2016, thus demonstrating its significant influence in the dissemination of knowledge. Sustainability (Switzerland) ranks next in prominence, with an h-index of 9, a g-index of 18, and the publication of 18 papers since 2019, indicative of its rapid ascent in visibility and impact. Benchmarking remains relevant, with an h-index of 7 and a total of 252 citations from 8 studies since 2018.

High-impact but less prolific sources encompass the Journal of Business Research, Resources, Conservation and Recycling, and Technological Forecasting and Social Change, which have received 239, 171, and 150 citations respectively, indicating considerable interdisciplinary interest. Emerging journals such as the TQM Journal and Environmental Technology and

Innovation exhibit promising influence, as evidenced by their substantial citation counts despite being relatively recent entrants in the field. Overall, the journal landscape remains dynamic, with well-established outlets dominating scholarly discourse and newer publications rapidly ascending in prominence. This trend underscores the expanding scope and interdisciplinary nature of MSME sustainability research over the past decade.

3.7 Co-occurrence Analysis

a) Network visualization:

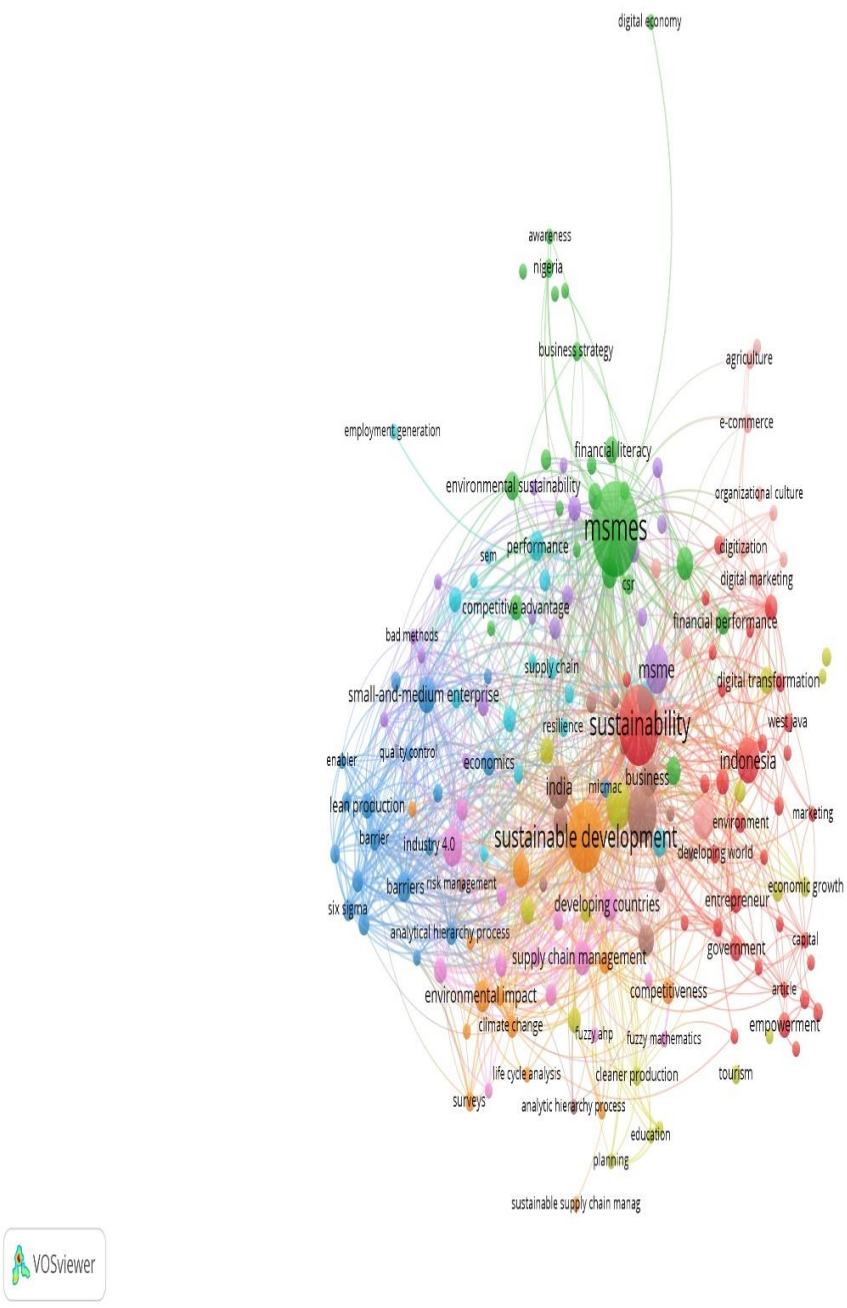


Figure 8: Co-occurrence analysis: Network Visualization

Source: Authors' representation

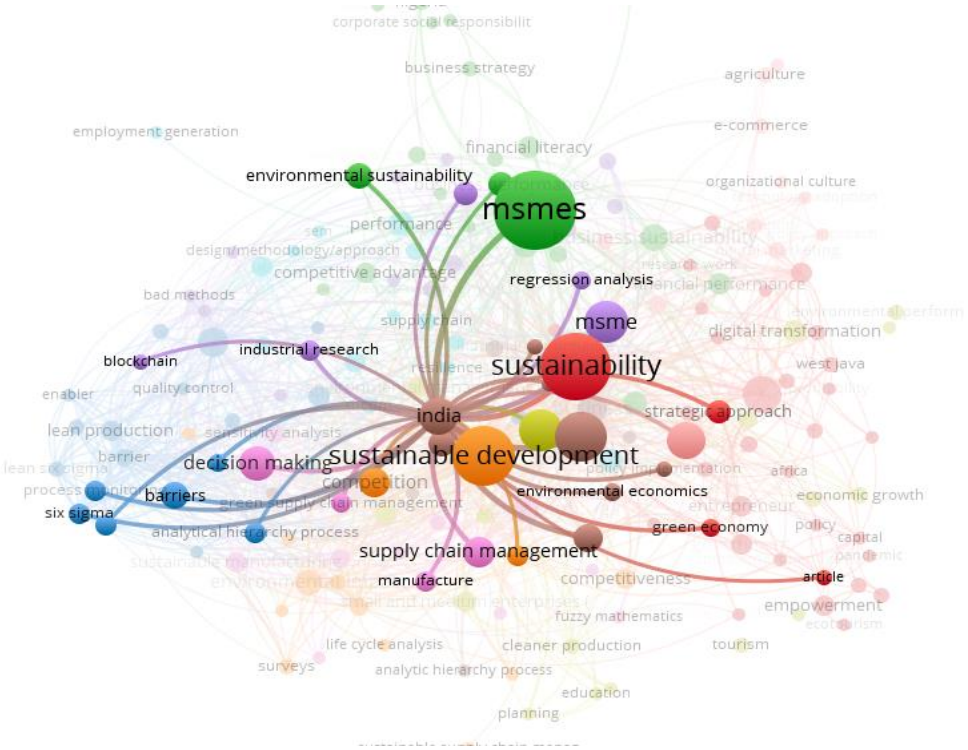


Figure 9: Co-occurrence analysis of Sustainability practices of MSMEs in India

Source: Authors' representation

Table VII: Keyword analysis

Theme	Label	Clusters	Weight <Links>	Weight <Total link strength>	Weight <Occurrence>
Theme One : Policy, Governance, and Strategic Empowerment for Sustainable MSME Development in Emerging Economies	Africa	1	12	14	3
	Business Development	1	29	38	7
	Capital	1	17	17	3
	Central Java	1	19	24	4
	Commercial Phenomena	1	21	25	3
	Developing World	1	19	25	4
	Ecotourism	1	11	12	3
	Empirical Analysis	1	21	24	3
	Empowerment	1	22	25	7
	Entrepreneur	1	25	35	7
	Environment	1	13	16	5
	Government	1	39	49	7
	Green Economy	1	20	27	4
	Implementation Process	1	19	23	4
	Indonesia	1	54	102	24
	Industrial Development	1	18	25	4
	Management Practice	1	20	22	3
	Marketing	1	27	28	3
	Msme Empowerment	1	12	14	4
	Msme Sustainability	1	6	7	4
	Pandemic	1	14	14	3
	Policy	1	21	21	3
	Profitability	1	9	9	3
	Qualitative Analysis	1	16	18	3
	Research Method	1	12	15	3
	Research Work	1	18	21	3
	Social Sustainability	1	17	19	3
	Spatiotemporal Analysis	1	11	12	3

	Strategic Approach	1	36	48	7
	Sustainability	1	140	347	72
	Sustainable	1	12	13	4
	Technology	1	14	16	4
Theme two: Corporate Sustainability, Digital Inclusion, and Performance Metrics in MSMEs	Awareness	2	3	3	3
	Business Performance	2	13	16	8
	Business Strategy	2	5	5	4
	Business Sustainability	2	29	42	12
	Competitive Advantage	2	26	30	7
	Corporate Social Responsibility	2	28	37	11
	Corporate Social Responsibility (CSR)	2	4	4	3
	Corporate Sustainability	2	16	16	4
	CSR	2	14	18	5
	Digital Economy	2	1	2	3
	Digital Literacy	2	4	4	3
	Enterprises	2	4	4	3
	Environmental Sustainability	2	23	30	9
	Financial Literacy	2	12	15	8
	Financial Performance	2	12	18	8
	Firm Performance	2	5	6	3
	Market Orientation	2	7	8	4
	Msmes	2	124	279	98
	New Normal	2	8	8	3
	Nigeria	2	10	13	4
	Small And Medium Enterprises	2	29	37	9
	Small Medium Enterprise	2	13	15	3
	Sustainable Entrepreneurship	2	9	10	5
Lean Systems, Total Quality Management, and Industry 4.0 Adoption in MSMEs	Analytical Hierarchy Process	3	41	61	6
	Barrier	3	40	71	6
	Barriers	3	48	91	10
	Economics	3	29	37	7
	Enabler	3	26	39	3
	Enablers	3	31	52	4
	Hierarchical Systems	3	29	34	3
	Industry 4.0	3	19	27	4
	Lean Production	3	42	86	7
	Lean Six Sigma	3	29	54	4
	Micmac	3	13	13	4
	Micro Small And Medium Enterprise	3	22	27	4
	Process Monitoring	3	34	73	6
	Quality Control	3	23	27	3
	Six Sigma	3	34	73	6
	Small-And-Medium Enterprise	3	67	134	15
	Technology Transfer	3	31	39	4
	Total Quality Management	3	19	20	3
	Work Simplification	3	34	73	6
Digital and Financial Interventions for Cleaner and Inclusive Growth in MSMEs	Cleaner Production	4	18	25	4
	Digital Transformation	4	25	35	8
	Economic Growth	4	17	26	5
	Education	4	11	17	3
	Entrepreneurial Orientation	4	7	7	3
	Environmental Management	4	39	47	8
	Environmental Performance	4	5	5	4
	Investment	4	8	8	3
	Micro	4	62	106	26

	Microfinance	4	14	15	5
	Planning	4	16	22	3
	Pollution Control	4	27	35	5
	Small And Medium Enterprise	4	41	59	7
	Small And Medium Enterprises (Msmes)	4	21	29	7
	Smes	4	16	19	6
	Students	4	11	17	3
	Tourism	4	7	7	4
Circular Economy and Sustainable Entrepreneurship in Developing Economies	Blockchain	5	20	22	3
	Circular Economy	5	39	53	7
	Developing Economies	5	15	19	3
	Economic And Social Effects	5	29	43	6
	Economic Development	5	15	19	6
	Energy Efficiency	5	24	25	3
	Financial Inclusion	5	11	11	4
	Green Entrepreneurship	5	14	21	3
	Industrial Research	5	35	50	6
	Msme	5	61	79	26
	Productivity	5	16	16	3
	Regression Analysis	5	19	22	4
	Small And Medium-Sized Enterprises	5	18	26	5
	Small Business	5	17	19	3
	Waste Management	5	27	38	6
Crisis Resilience and Sustainable Supply Chain Management in MSMEs Post-COVID-19	Confirmatory Factor Analysis	6	23	27	3
	Covid-19	6	36	49	12
	Design/Methodology/Approach	6	25	26	3
	Employment Generation	6	6	7	3
	Entrepreneurship	6	19	22	9
	Exploratory Factor Analysis	6	25	30	3
	Factor Analysis	6	41	57	7
	Micro-Enterprises	6	37	56	7
	Performance	6	26	36	10
	Resilience	6	13	14	4
	Sem	6	10	10	3
	Supply Chain	6	17	18	6
	Supply Chains	6	37	47	5
	Sustainable Performance	6	16	18	6
	System Dynamics	6	11	11	4
Sustainable Manufacturing and Life Cycle Approaches in MSMEs	Climate Change	7	35	42	6
	Commerce	7	34	44	6
	Competition	7	70	107	12
	Competitiveness	7	21	28	7
	Environmental Impact	7	44	76	11
	Life Cycle	7	25	33	4
	Life Cycle Analysis	7	12	15	3
	Performance Assessment	7	15	15	3
	Smart Manufacturing	7	18	22	3
	Surveys	7	32	39	4
	Sustainable Development	7	125	346	56
	Sustainable Production	7	12	16	3
	Sustainable Supply Chain Management	7	9	9	3
	Sustainable Supply Chains	7	16	21	3
	Textiles	7	16	22	3
Policy Implementatio	Analytic Hierarchy Process	8	6	6	3
	Business	8	40	52	13

n and Industrial Economics in Indian MSME Sustainability	Entrepreneurship And Small Business Management	8	5	5	3
	Environmental Economics	8	24	30	4
	India	8	64	120	21
	Industrial Performance	8	19	23	3
	Manufacturing	8	39	64	11
	Microeconomics	8	16	21	3
	Policy Implementation	8	20	25	3
	Risk Management	8	20	20	3
	Small	8	31	42	9
	Small And Medium-Sized Enterprise	8	102	229	37
	Sustainable Development Goal	8	21	21	3
	Sustainable Development Goals	8	27	28	5
Decision Support Systems and Analytical Models for Sustainable MSME Operations	Collaboration Capability	9	23	28	3
	Decision Making	9	72	148	18
	Developing Countries	9	44	64	11
	Fuzzy Ahp	9	19	19	3
	Fuzzy Analytical Hierarchy Process	9	11	18	3
	Fuzzy Mathematics	9	17	21	3
	Green Manufacturing	9	41	50	6
	Green Supply Chain Management	9	11	18	5
	Holistic Approach	9	21	22	3
	Manufacture	9	36	44	6
	Open Innovation	9	26	33	4
	Sensitivity Analysis	9	40	55	6
	Supply Chain Management	9	50	84	13
	Sustainable Manufacturing	9	29	47	7
Technological Innovation, Digitalization, and Stakeholder Engagement for MSME Growth	Agriculture	10	5	5	4
	Digital Marketing	10	20	26	5
	Digitalization	10	24	25	5
	Digitization	10	20	28	4
	E-Commerce	10	16	19	4
	Fintech	10	3	3	3
	Innovation	10	56	93	20
	Organizational Culture	10	9	9	3
	Policy Approach	10	17	22	3
	Stakeholder	10	21	28	6
	Technology Adoption	10	17	24	3

(Source: Author representation)

The VOSviewer co-occurrence network visualization [Figure 8] provides a systematic overview of sustainability research pertaining to micro, small, and medium enterprises (MSMEs). Derived from keyword co-occurrence data obtained from the Scopus database, the network encompasses ten distinct thematic clusters, each distinguished by a different color to signify both the frequency of keywords and the strength of their interconnections. This configuration illustrates the diversity of subjects within the field and underscores the relationships among various subdomains.

Cluster 1 (Red) "*Policy, Governance, and Strategic Empowerment*" encompasses key terms such as sustainability, policy, and green economy. It underscores governance frameworks and strategic policies designed to foster the sustainability of MSMES in emerging markets. Cluster 2 (Green) "*Corporate Sustainability and Digital Inclusion*" synthesises concepts such as corporate social responsibility, organisational performance, and the digital economy,

integrating corporate responsibility with the adoption of technology in a post-pandemic context. Cluster 3 (Blue) "*Lean Systems and Industry 4.0*" integrates lean production, Six Sigma, and Industry 4.0, emphasising the integration of quality management with advanced manufacturing technologies. Cluster 4 (Yellow) "*Digital and Financial Interventions*" concentrates on digital transformation, microfinance, and environmental management, highlighting how digital and financial mechanisms facilitate inclusive growth. Cluster 5 (Purple) "*Circular Economy and Entrepreneurship*" emphasises circular economy, green entrepreneurship, and financial inclusion by highlighting resource efficiency and entrepreneurial strategies aimed at sustainable growth.

Cluster 6 (Light Blue) "*Crisis Resilience and Supply Chain Management*" with keywords such as COVID-19 and resilience, addresses adaptive responses to disruptions, particularly in the post-pandemic period. Cluster 7 (Orange) "*Sustainable Manufacturing"* encompasses life cycle analysis, eco-design, and smart manufacturing, underscoring the integration of sustainability into production processes.

Cluster 8 (Brown) "*Policy and Industrial Economics in India*" integrates policy implementation, Indian context, and environmental economics, concentrating on policy impacts and economic reforms within the Indian MSME sector. Cluster 9 (Pink) "*Decision Support and Analytical Models*" comprises fuzzy AHP, multi-criteria decision making, and supply chain management, exemplifying quantitative methods for sustainability-related decision-making. Cluster 10 (Turquoise/Teal) "*Technological Innovation and Stakeholder Engagement*" features innovation, e-commerce, and digital marketing, emphasising digital growth strategies and stakeholder collaboration.

Collectively, the network exemplifies a multifaceted and interconnected research landscape, encompassing governance, operations, technology, entrepreneurship, crisis management, and analytical modelling. The identified inter-cluster linkages, such as those between digital transformation and environmental management, indicate emerging integrative perspectives within the MSME sustainability literature.

Figure 9 presents a bibliometric network visualization generated using VOSviewer, offering a comprehensive overview of research concerning sustainability in Indian micro, small, and medium enterprises (MSMEs). Prominent themes—including sustainability, sustainable development, and MSMEs—emerge as central nodes, underscoring their significance within academic discourse.

Co-occurrence patterns demonstrate robust associations with concepts such as supply chain management, decision-making, and environmental sustainability, thereby highlighting the intricate nature of scholarly investigations into MSME sustainability.

Clusters incorporating terms such as financial literacy, entrepreneurship, barriers, and the green economy signify an increasing focus on the strategic and practical aspects of embedding sustainability within MSME practices. India's role as a pivotal connector within the network underscores its geographical significance and the policy importance of this research domain.

Overall, the visualization emphasises a growing consensus among scholars regarding key themes such as sustainability-driven innovation, regulatory frameworks, and performance metrics. This underscores the sector's crucial role in achieving national sustainable development objectives and highlights the significance of continued research to inform policy and practice.

3.8 Overlay Visualization:

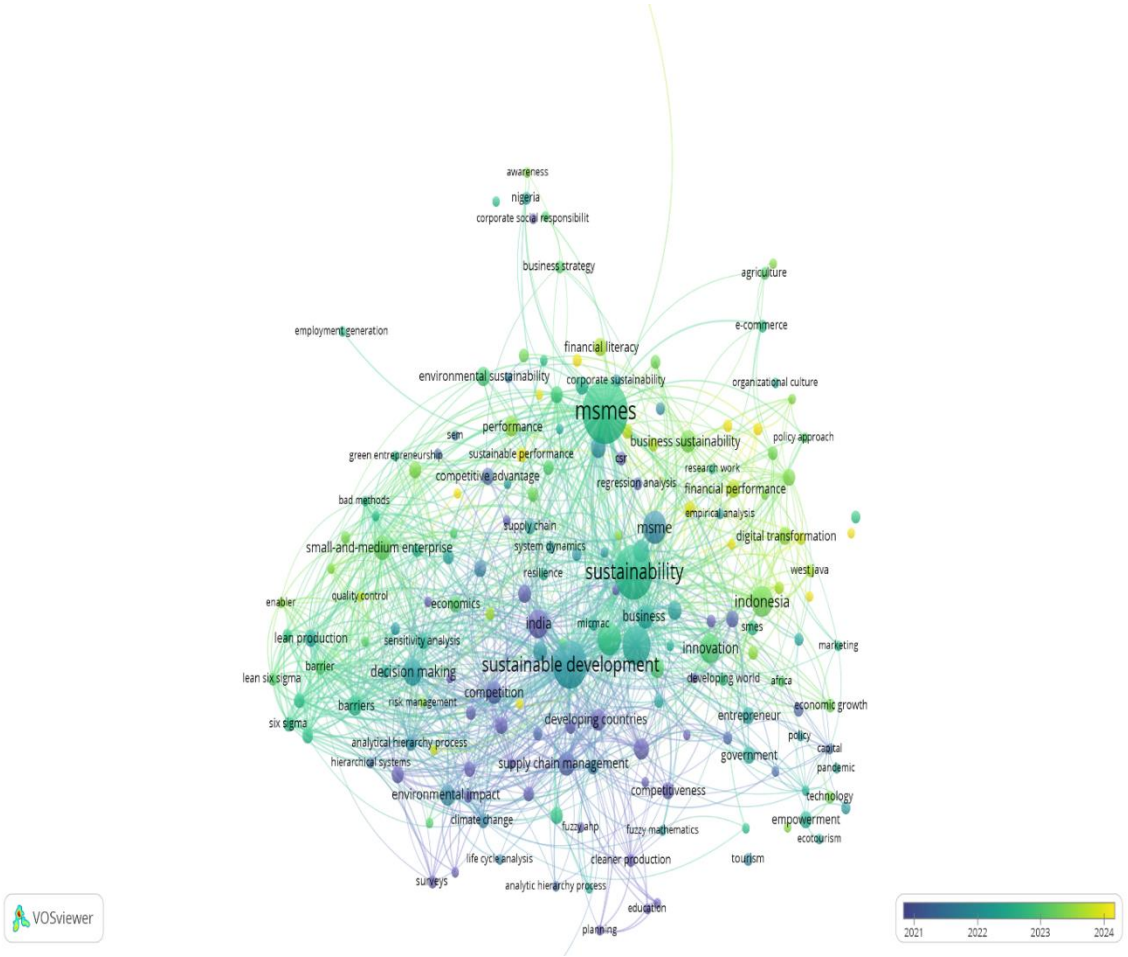


Figure 10: Overlay Visualization

Source: Authors' representation

Figure 10 presents a VOSviewer analysis of co-authorship and thematic networks, illustrating the intellectual framework and collaboration patterns within sustainability research focused on micro, small, and medium enterprises (MSMEs). The visualization highlights key clusters centred around core themes such as sustainability, MSMEs, and sustainable development, indicated by the largest and most interconnected nodes. These clusters represent the primary focus areas of scholarly investigation in this field.

Geographical and contextual nodes such as India, Indonesia, and developing countries emphasise the focus on region-specific studies, demonstrating a balance between global relevance and local insights. The colour gradient overlay illustrates how research focus has evolved from year 2021 to 2024, reflecting shifts in priorities over time. In 2021, prominent keywords including supply chain management, environmental impact, competitiveness, developing countries, India, and SMEs underscored key themes related to operational performance and environmental concerns in emerging contexts. By 2022, the scope expanded to encompass topics such as sustainable development, decision-making, business, Six Sigma, barriers, lean production, MSMES, entrepreneurship, and e-commerce, indicating a growing interest in process optimisation, entrepreneurship, and digital trade.

In 2023, keywords such as small and medium enterprises, environmental sustainability, innovation, digital transformation, financial performance, business sustainability, and performance highlighted the integration of technological and financial dimensions. By 2024, emerging themes including empirical analysis, policy frameworks, financial literacy, and entrepreneurship indicated a shift towards evidence-based policy formulation and capacity development within MSMEs.

The robust connections among concepts such as supply chain management, decision-making, and competitive advantage underscore the complex and interconnected challenges that MSMEs encounter in achieving sustainability.

3.9 Density Visualization:

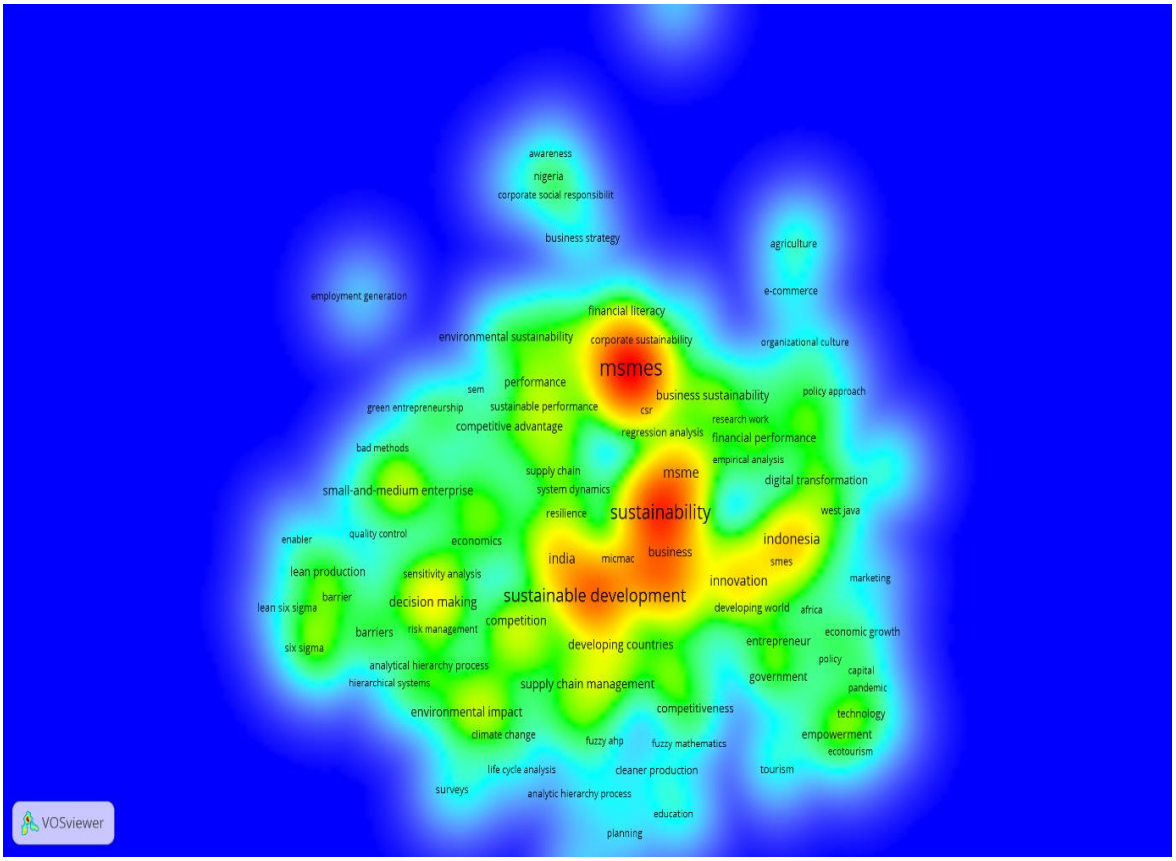


Figure 11: Density Visualization

Source: Authors' representation

The density map generated utilising VOSviewer [Figure 11] illustrates the relative frequency and co-occurrence density of terms within MSME sustainability research. Grey and blue regions denote low-frequency terms and weak co-occurrence connections, thereby signifying emerging or under-explored subjects.

Conversely, red and yellow areas highlight well-established themes—such as MSMEs, sustainability, and sustainable development—which are prominently featured in contemporary academic discourse.

Terms exemplified by grey shading, such as employment generation, corporate social responsibility, awareness, e-commerce, and agriculture, denote peripheral or niche areas that merit further scholarly investigation.

These less emphasised domains frequently underscore emerging research themes or context-dependent issues with considerable potential. For instance, although employment generation constitutes a crucial socio-economic contribution of MSMEs—particularly in developing nations like India—it remains insufficiently examined in the extant literature.

Likewise, the infrequent references to e-commerce and agriculture suggest opportunities for the integration of digital solutions and sector-specific innovations to bolster MSME sustainability strategies.

By emphasising these less-studied areas, the density visualization serves as a strategic guide for identifying future research directions and addressing existing gaps. Concentrating on these themes can foster a more comprehensive, inclusive, and contextually relevant understanding of sustainability within the MSME sector.

4. CONCLUSION AND IMPLICATIONS

This study provides a comprehensive bibliometric and scientometric analysis of global research concerning sustainability in micro, small, and medium enterprises (MSMEs), examining 351 publications indexed in Scopus between 2012 and 2025. The findings indicate a rapidly expanding field—particularly since 2018 and reaching its zenith in 2024—although it remains thematically fragmented and exhibits regional disparities.

The predominant research areas include Business, Management and Accounting, Social Sciences, and Environmental Sciences, underscoring the multifaceted nature of MSME sustainability. The authorship analysis conforms to Lotka's Law, identifying a small core of highly active scholars, primarily from Indonesia and India, who significantly influence the discourse. India demonstrates superior citation efficiency and functions as a pivotal connector in international collaborations networks.

Thematic mapping identifies ten key clusters encompassing governance, corporate responsibility, technological innovation, supply chain resilience, sustainable manufacturing, and decision-support systems. These findings have significant implications for academics, policymakers, and practitioners.

For scholars, identifying underexplored yet high-potential themes—such as employment creation, e-commerce, agriculture-related sustainability, and financial literacy—presents opportunities for context-specific and interdisciplinary research, particularly through comparative studies outside the primary regions of Indonesia India. For practitioners, including MSME owners, managers, NGOs, and sustainability advisors, the findings underscore actionable strategies such as adopting lean production, Industry 4.0 tools, circular economy models, and CSR-led green innovation.

Additionally, they address skill gaps in digital integration and sustainable supply chain practices. The evidence indicating that citation efficiency increases with international collaboration highlights the importance for practitioners to engage with global knowledge networks to bolster innovation capacity. For policymakers, the disparities highlight the need for targeted incentives to boost research and adoption in underserved areas.

It also emphasises integrating digitalisation with sector-specific sustainability policies, like in agriculture and manufacturing. establishing cross-border funding mechanisms aligned with the UN Sustainable Development Goals can be beneficial. These insights deepen understanding and provide an evidence base for policies that enhance MSME competitiveness, resilience, and sustainable development.

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